FOOD Farmers

Federation Of Organic Dairy Farmers

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Chief, Standards Development and Review Branch,
National Organic Program, Transportation and Marketing Programs
USDA–AMS–TMP–NOP, 1400 Independence Ave., SW.
Room 4008– So., Ag Stop 0268
Washington, DC 20250.

Docket Number AMS–TM–06–0198; TM–05–14

December 23, 2008

Dear Richard,
These comments are sent on behalf of the Federation Of Organic Dairy Farmers (FOOD Farmers), the umbrella organization of the Northeast Organic Dairy Producers Alliance (NODPA), the Midwest Organic Dairy Producers Alliance (MODPA), and the Western Organic Dairy Producers Alliance (WODPA), which represents over 1,200 organic dairy farmers across the country.

We thank USDA for writing a rule with the specificity that holds organic dairy producers to the high standard that consumers expect and producers requested from NOP. It gives very clear language that certifiers can use to implement the rule fairly and universally. The 26-page document contains rulemaking language that provides measurable and verifiable pasture grazing standards, clearly prohibiting drylots and feedlots, and strengthening the role that the organic systems plan plays in organic certification.

These recommendation and comments on the Proposed Rule are made on behalf of FOOD Farmers and other signatures. We wish to acknowledge the cooperation and work of the following organizations and their members in the development of these recommendations and comments: National Organic Coalition, Accredited Certifiers Association, Organic Trade Association, Consumers Union, National Campaign for Sustainable Agriculture, Midwest Organic Services Association, Inc., The Cornucopia Institute, and organic dairy processors. We thank all those myriad individuals and organizations whose suggestions and ideas have led to what we put forward as clear and concise rulemaking language, reflecting the input from an extremely broad cross section of the organic community.

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While the Final Rule is being shepherded through the Federal review progress prior to being published and implemented, we strongly urge NOP to enforce the current regulation in regards to pasture. We look forward to the publication of a Final Rule in spring 2009 with one season to implement the rule. We urge NOP to carefully monitor the enforcement of the new regulation.

We support the department's recently announced priority to provide educational resources to certifiers and their inspectors. During the process of working with many groups to discuss the benefits and challenges of this proposed rule, it has become even more evident that there is great disparity between the interpretations of different standards by certifiers. We hope that this rule will provide clear parameters and requirements for certifiers to enforce that will level the economic and production playing field across the country.

We would like to offer the proposition that some certifiers will need more education on the realities of organic livestock production than others and suggest that NOP examine their accreditation process to take into account the necessary rigor that is needed in certifying organic livestock operations.

We understand through the remarks made by Richard Mathews at the listening sessions that the inclusion of changes to the language in the Origin of Livestock section was to encourage comment rather than deal with the existing two track system for replacement livestock

We **strongly advocate for the immediate publication of a proposed rule on Origin of Livestock** to stop the continuous transition of conventional animals as dairy replacements, which undermines the integrity of the Organic Seal. FOOD Farmers has long supported the need for changes in the Origin of Livestock rule, so that the economic and production playing field can truly be level for all producers.

The following are areas where we will provide some detailed comment in the next section of this document:

1. We applaud the fact that the proposed rule includes the requirement for a minimum 30% dry matter intake (DMI) from pasture, averaged over the full growing season, with the growing season ranging from 121 to 365 days. We suggest that "grazing season" be substituted for "growing season," as that can be better defined to take into account the reality of the grazing seasons in different areas.

2. We recommend changing the requirement for ruminants to be managed on pasture year round to a requirement that ruminants be managed on pasture only during the grazing season. This will take into account different farming conditions, it will protect pastures from damage, prevent manure runoff contamination of waterways, and will not cause any risks to the health and safety of the livestock from winter weather conditions.

3. We advise the reinstatement of needed exemptions for ruminants from pasture and outdoor access during periods of inclement weather and to protect soil and water quality.

4. We suggest the revision of the definition of inclement weather to take into account conditions that could cause temporary rather than just permanent physical harm to livestock to be a valid exemption.

5. We welcome the definition of sacrificial pasture as it can be an acceptable use of pasture and is used by some graziers. The definition correctly draws the distinction between a sacrificial pasture and a feed lot specifically with the words "restored to active pasture management." We do not want the use mandated as the practice may be detrimental to the environment, including to soil and water quality and to animal health when operations do not have well drained land that is accessible for livestock or during winter weather or excessive rain conditions.

6. Crop material bedding must be organically certified when it is typically consumed by the species**,** even if it's not a typical feed for the certified operation using the bedding.

7. We suggest creating minimal new record keeping requirements for livestock operations within the rule and in guidance, replacing the overly prescriptive text proposed by the NOP.

8. Concerning replacement dairy animals, we do not want the new language proposed by the NOP to be implemented. We welcome the opportunity to provide the NOP with comments on the origin of livestock and advocate for the rapid publication of a Proposed Origin of Livestock Rule that has one criteria for dairy replacement animals for all operations: "Once an operation has been certified for organic production, all dairy animals born or brought onto the operation shall be under organic management from the last third of gestation."

9. We want to state very clearly that lactation is not a stage of life that would exempt ruminants from any of the mandates in this regulation.

10. The proposed Pasture Practice Standard requires extensive, detailed information from producers: parts of it should remain in the rule to ensure that there is a comprehensive

pasture plan in every ruminant livestock operation’s organic system plan, describing their pasture management system, but other parts can be deleted that refer to the haymaking system or will be covered by pasture being classified as a crop**.**

11. We recommend removing some of the duplicative text in Livestock Living Conditions and moving some of the very prescriptive proposed text to guidance for certifiers and producers, as production practices vary with location and climate and from operation to operation.

12. We support that, during the grazing season, ruminant slaughter stock that are typically grain finished to meet consumer expectations may be exempt from the 30% pasture DMI requirement during the finishing period, not to exceed 120 days, but must not be denied access to pasture during that period.

13. We request that "bee" and "fish used for food" be removed from the definition of "livestock" until proposed standards are issued for those production systems.

As organic dairy producers across the country whose families rely on the income that is generated by our organic farms, we urge you to consider our comments on the Proposed Rule. We welcome the publication of the Proposed Rule and support the intent to provide very specific standards that can level the playing field for all organic dairy producers. We produce a high quality product to standards that are supported by consumers and their advocates, and we, as organic dairy producers, will do everything within our power to ensure that the organic rule continues to separate and distinguish organic dairy products as the result of thoughtfully written and fairly enforced organic standards and practices.

We strongly advocate that you move forward quickly to the publication of a Final Rule on Access to Pasture. Please contact Ed Maltby, NODPA Executive Director, at 413-772-044 or ednodpa@comcast.net or 30 Keets Rd, Deerfield, MA 01342, for more information on our comments.

Sincerely

Henry Perkins

Henry Perkins, NODPA President

Darlene C Coehoorn

Darlene Coehoorn, MODPA President

Tony J. Azevedo

Tony Azevedo, WODPA President

Federation Of Organic Dairy Producers (FOOD Farmers)

The Federation Of Organic Dairy Producers is an umbrella group for the three regional organic dairy farmer organizations: Northeast Organic Dairy Producers Alliance (NODPA), Midwest Organic Dairy Producers Association (MODPA), and Western Organic Dairy Producers Alliance (WODPA). FOOD Farmers represents over 1,200 or two thirds of organic dairy farmers across the country. The organic dairy farmers have many different production methods including seasonal grass based dairies and more traditional production methods that combine pasture, conserved forage and grain. They also market their milk in many different ways, selling to the major brands including Horizon Organic, Organic Valley, Stonyfield, Humboldt Dairy, as well as through smaller cooperatives including Upstate Farms Cooperative, Organic Choice and LOFCO, and independent manufacturers of organic dairy product and direct to the consumer.

Northeast Organic Dairy Producers Alliance (NODPA)

NODPA represents 820 organic dairy farmers in the East of the USA

The mission of the Northeast Organic Dairy Producers Alliance is to enable organic dairy family farmers, situated across an extensive area, to have informed discussion about matters critical to the well being of the organic dairy industry as a whole, with particular emphasis on:

1. Establishing a fair and sustainable price for their product at the wholesale level.
2. Promoting ethical, ecological and economically sustainable farming practices.
3. Developing networks with producers and processors of other organic commodities to strengthen the infrastructure within the industry.
4. Establishing open dialogue with organic dairy processors and retailers in order to better influence producer pay price and to contribute to marketing efforts.

Midwest Organic Dairy Producers Association (MODPA) mission is to promote communication and networking for the betterment of all Midwest dairy producers and enhance a sustainable farmgate price

Western Organic Dairy Producers Alliance (WODPA) mission is to preserve, protect, and ensure the sustainability and integrity of organic dairy farming across the west.

The following farms, individuals and organizations have signed on to the FOOD Farmers comments and recommendations:

Humboldt Creamery, CA
National Farmers Organization, IA
Organic Choice, WI
Organic Dairy Farmers Cooperative, Seneca Falls, NY
Twin Oaks Dairy LLC, Truxton, NY
Klass and Mary-Howell Martens, Penn Yan, NY
Fran Lan Farm, Cobleskill, NY
Bundy Creek Farm, Truxton, NY
Andrew Dykstra, WA
Jonas K. Stoltzfus, JuJo Acres Farm, PA
Rodney Martin, Bridge View Dairy, Oxford, PA
Perry Clutts, Circleville, Ohio 43113
Appalachian Crafts Farm, Robin Reed, KY
Cynthia A. Daley, Ph.D., Organic Dairy Program Coordinator, Chico, CA
College of Agriculture, California State University, Chico, CA
NOFA Mass

National Organic Program Regulatory Text Livestock Sections Updated to Include October 24, 2008 Proposed Pasture Rule and FOOD Farmers suggested language changes and comments

KEY TO DOCUMENT

- NOP proposed changes indicated in underline and ~~strikethrough~~ format.
- FOOD Farmers suggested deletions and additions to NOP's wording indicated by ***bold italics.*** (For example, words that are underlined, with strikethrough, and in bold italics would be text added by NOP but suggested for deletion by FOOD Farmers).

NOTE: Many definitions and sections of the regulation not relevant to the proposed changes have been left out of this compressed version.

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Subpart A—Definitions

Class of animal. A group of livestock that shares a similar stage of life or production.

Crop. Pastures, ~~***sod***~~, cover crops, green manure crops, catch crops, and any plant or part of a plant intended to be marketed as an agricultural product, fed to livestock, or used in the field to manage nutrients and soil fertility.

Dry matter. The amount of a feedstuff remaining after all the free moisture is evaporated out.

Dry matter demand. The expected dry matter intake for a class of animal.

Dry matter intake: Total pounds of all feed, devoid of all moisture, consumed by a class of animals over a given period of time.

Dry lot. A ~~***confined***~~ ***,fenced*** area that may be covered with concrete, but that has ***little or*** no vegetative cover.

Feed. Edible materials which are consumed by livestock for their nutritional value. Feed may be concentrates (grains) or roughages (hay, silage, fodder). The term, "feed," encompasses all agricultural commodities, including pasture ingested by livestock for nutritional purposes.

Feed additive. A substance added to feed in micro quantities to fulfill a specific nutritional need; i.e., essential nutrients in the form of amino acids, vitamins, and minerals.

Feedlot. A ~~***confined area***~~ ***drylot*** for the controlled feeding of ~~***ruminants***~~ ***livestock***.

Feed supplement. A combination of feed nutrients added to livestock feed to improve the nutrient balance or performance of the total ration and intended to be:
(1) Diluted with other feeds when fed to livestock;
(2) Offered free choice with other parts of the ration if separately available; or
(3) Further diluted and mixed to produce a complete feed.

Field. An area of land identified as a discrete unit within a production operation.

Forage. Vegetative material in a fresh, dried, or ensiled state (pasture, hay, or silage), which is fed to livestock.

Graze. (1) The consumption of standing ***or residual*** forage by livestock. (2) To put livestock to feed on standing ***or residual*** forage.

Grazing. To graze.

Grazing season. The period of time when pasture is available for grazing, due to natural precipitation or irrigation. Grazing season dates may vary because of mid-summer heat / humidity, significant precipitation events, floods, hurricanes, droughts or winter weather events. Grazing season may be extended by the grazing of residual pasture as agreed in the operation's organic systems plan. Due to weather, season, and/or climate, the grazing

season may or may not be continuous. Grazing season may range from 120 days to 365 days.

The period of time between the average date of the last killing frost in the spring to the average date of the first killing frost in the fall or early winter in the local area of production. This represents a temperature threshold of 28 degrees Fahrenheit (-3.9 degrees Celsius) or lower at a frequency of 5 years in 10. Growing season may range from 121 days to 365 days.

Inclement weather. Weather that is violent, or characterized by temperatures (high or low), ***or excessive precipitation*** that can ***kill or*** cause ***permanent*** physical harm to a given species of livestock. ***Production yields or growth rates of livestock lower than the maximum achievable do not qualify as physical harm.***

Killing frost. A frost that takes place at temperatures between 25 degrees and 28 degrees Fahrenheit (-2.2 and -3.9 degrees Celsius) for a period sufficiently severe to end the growing season or delay its beginning.

Livestock. Any ***bee,*** cattle, sheep, goat, swine, poultry, or equine animals used for food or in the production of food, fiber, ***or*** feed, or other agricultural-based consumer products; ***fish used for food;*** wild or domesticated game; or other nonplant life, except such term shall not include aquatic animals or bees for the production of food, fiber, feed, or other agricultural-based consumer products.

Pasture. Land used for livestock grazing that is managed to provide feed value and maintain or improve soil, water, and vegetative resources.

Residual forage. Standing forage or forage cut and left to lie in place in the pasture.

Sacrificial pasture. A pasture or pastures within the pasture system, of sufficient size to accommodate all animals in the herd without crowding, where animals are kept for short periods during saturated soil conditions to confine pasture damage to an area where potential environmental impacts can be controlled; ***or where animals are kept in the non-grazing season to provide access to the outdoors.*** This pasture is then deferred from grazing until it has been restored through active pasture management. Sacrificial pastures are located where soils have good trafficability, are well-drained, have low risk of soil erosion, have low or no potential of manure runoff, are surrounded-by vegetated areas, and are easily restored. ***A sacrificial pasture is land used for livestock grazing that is managed to provide feed value and maintain or improve soil, water, and vegetative resources;*** It is not a dry lot or feedlot.

Shelter. Structures such as barns, sheds, or windbreaks, or natural areas such as woods, tree lines, or geographic land features that provide physical protection and / or housing to animals.

Stage of life. A discrete time period in an animal's life which requires specific management practices different than during other periods; such as: calves, chicks, etc.

Temporary and Temporarily. Occurring for a limited time only (e.g., overnight, throughout a storm, during a period of illness, the period of time specified by the Administrator when granting a temporary variance), not permanent or lasting.

Yard / feeding pad. An improved area for feeding, exercising, and outdoor access for livestock during the non grazing season and a high traffic area where animals may receive supplemental feeding during the grazing season.

FOOD Farmer comment to NOP: Remove any consideration of origin of livestock from this rule change and work diligently to get a proposed rule on origin of livestock published as soon as possible that will stop the continuous transition of conventional animals as dairy replacements.

§ 205.236 Origin of livestock.

(a) Livestock products that are to be sold, labeled, or represented as organic must be from livestock under continuous organic management from the last third of gestation or hatching: *Except*, That:

….

(2) *Dairy animals.* Milk or milk products must be from animals that have been under continuous organic management beginning no later than 1 year prior to the production of the milk or milk products that are to be sold, labeled, or represented as organic, *Except*,

(i) That, crops and forage from land, included in the organic system plan of a dairy farm, that is in the third year of organic management may be consumed by the dairy animals of the farm during the 12-month period immediately prior to the sale of organic milk and milk products; and

(ii) That, when an entire, distinct herd is converted to organic production, the producer may, *provided* no milk produced under this subparagraph enters the stream of commerce labeled as organic after June 9, 2007: (a) For the first 9 months of the year, provide a minimum of 80-percent feed that is either organic or raised from land included in the organic system plan and managed in compliance with organic crop requirements; and (b) Provide feed in compliance with §205.237 for the final 3 months.

FOOD Farmer comment: do not adopt changes in (iii) below.

(iii) Once ~~an entire, distinct herd~~ an operation has been ~~converted to~~ certified for organic production using the exception in paragraph (a)(2)(i) or (ii) of this section all dairy animals brought onto the operation shall be under organic management from the last third of gestation.

§ 205.237 Livestock feed.

(a) The producer of an organic livestock operation must provide livestock with a total feed ration composed of agricultural products, including pasture and forage, that are organically produced by operations certified to the NOP, except as provided in § 205.236(a)(i), and, if applicable, organically handled by operations certified to the NOP: *Except*, That, ~~nonsynthetic substances and~~ synthetic substances allowed under §205.603 and nonsynthetic substances may be used as feed additives and supplements, *Provided*, That, all agricultural ingredients in such additives and supplements shall have been produced and handled organically.

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

(1) Use animal drugs, including hormones, to promote growth;

(2) Provide feed supplements or additives in amounts above those needed for adequate nutrition and health maintenance for the species at its specific stage of life;

(3) Feed plastic pellets for roughage;

(4) Feed formulas containing urea or manure;

(5) Feed mammalian or poultry slaughter by-products to mammals or poultry; ~~or~~

(6) Use feed, feed additives, and feed supplements in violation of the Federal Food, Drug, and Cosmetic Act;

(7) Provide feed or forage to which anyone, at anytime, has added an antibiotic; or

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

(c) During the ~~***growing***~~ ***grazing*** season, producers shall 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. The grazing season must be not less than 120 days per year. Due to weather, season, and/ or climate, the grazing season may or may not be continuous.*

(1) Except that, ruminant slaughter stock that are typically grain finished may be exempt from the 30% pasture DMI requirement during the finishing period, not to exceed 120 days, but must not be denied access to pasture during that period; and that breeding bulls may be exempt from the 30% pasture DMI and pasture access, but if denied pasture access cannot be considered organic slaughter stock.

(2) Grazing season must be described in the operation's organic system plan and be approved by the certifier as being representative of the typical grazing season duration for the particular area. Certifiers, in reviewing the organic system plan, shall confirm that adequate fields are set aside for pasture to provide grazing for ruminants for the entire grazing season, showing intent to maximize grazing beyond the 120 day minimum. Irrigation must be used as needed to promote pasture growth when an operation has it available for use on crops.

(3) In areas where irrigation is not available, certifiers may grant a temporary variance from the 120 days/30% DMI regulation, due to damage caused by atypical drought, flooding, excessive rainfall, or fire, that is experienced during the normal grazing season. Variances are good for a single farm and a producer will only be granted a total of three over a ten year period.

~~***Producers shall, once a month, on a monthly basis:***~~

(d) Producers shall:

(1) Describe the total feed ration for each type and class of animal;

(2) Document changes that are made to all rations throughout the year in response to seasonal grazing changes;

(3) Provide the method for calculating dry matter demand and dry matter intake to certifier for approval.

~~***(1) Document each feed ration (i.e., for each type of animal, each class of animal's intended daily diet showing all ingredients, daily pounds of each ingredient per animal, each ingredient's percentage of the total ration, the dry matter percentage for each ingredient, and the dry matter pounds for each ingredient);***~~

~~***(2) Document the daily dry matter demand of each class of animal using the formula:***~~

~~***Average Weight/Animal (lbs) × .03 = lbs DM/Head/Day × Number of Animals = Total DM Demand in lbs/Day;***~~

~~***(3) Document how much dry matter is fed daily to each class of animal in all rations; and***~~

~~***(4) Document the percentage of dry matter fed in all rations daily to each class of animal using the formula: (DM Fed ÷ DM Demand in lbs/day) × 100 = % DM Fed.***~~***.***

§ 205.238 Livestock health care practice standard.

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

(1) Selection of species and types of livestock with regard to suitability for site-specific conditions and resistance to prevalent diseases and parasites;

(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;

(5) Performance of physical alterations as needed to promote the animal's welfare and in a manner that minimizes pain and stress; and

(6) Administration of vaccines and other veterinary biologics.

(b) When preventive practices and veterinary biologics are inadequate to prevent sickness, a producer may administer ***nonsynthetic substances provided they are not prohibited under 205.604. In addition a producer may administer*** synthetic medications: *Provided,* That, such medications are allowed under §205.603….

§ 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 those listed in paragraphs (a)(1) through (a)(~~*3*~~ ***4***) of this section. ~~***Further, producers shall not prevent, withhold, restrain, or otherwise restrict animals from being outdoors, except as otherwise provided in paragraph (b) and (c) of this section.***~~ Producers shall also provide:

(1) Year-round access for all animals to the outdoors, shade, shelter, exercise areas, fresh air, ***clean*** water for drinking ~~***(indoors and outdoors),***~~ and direct sunlight suitable to the species, its stage of life ~~production~~, the climate, and the environment***, except as otherwise provided in paragraph (b) of this section. Continuous, total confinement in dry lots and feedlots is prohibited.***

~~(2) Access to pasture for ruminants;~~

(2) For all ruminants, ***provision of pasture throughout the grazing season to meet the requirements of 205.237*** ~~***continuous year-round management on pasture***~~, except as otherwise provided in paragraph (c) of this section***.*** ~~***, for: (i) Grazing throughout the growing season; and***~~

~~***(ii) Access to the outdoors throughout the year, including during the non-growing season. Dry lots and feedlots are prohibited.***~~

(3) Appropriate clean, dry bedding. ~~If the bedding is typically consumed by the animal species,~~ When ~~***hay, straw, ground cobs, corn stalks, or other***~~ crop matter typically fed to the animal species is used as bedding, it must comply with the feed requirements of §205.237. ***Genetically modified crop matter must not be used as bedding;***

(4) Shelter***, as needed and appropriate to the species***, 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) Yards***, feeding pads,*** and ~~***passageways***~~ ***laneways*** kept in good condition and well-drained;

(b) The producer of an organic livestock operation may ***provide temporary confinement*** ~~provide temporary confinement for an animal~~ ~~***temporarily deny a non-ruminant animal access to the outdoors***~~ ***and shelter for an animal*** because of:

(1) Inclement weather ***and conditions caused by inclement weather;***

(2) The animal's stage of ~~production~~ life. ***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; or

(4) Risk to soil or water quality.

(c) The producer of an organic livestock operation may temporarily deny a ruminant animal pasture ***or outdoor access*** under the following conditions:

(1) When the animal is segregated ***for the day of breeding or preventive health care practice, or for the*** treatment of illness or injury (the various life

stages, such as lactation, are not an illness or injury);

(2) One ***week at the end of a lactation for dry off, three*** week***s*** prior to parturition (birthing), parturition, and up to one week after parturition;

(3) In the case of newborns for up to six months, after which they must be on pasture ***during the grazing season*** and may no longer be individually housed;

(4) In the case of goats, during periods of inclement weather;

(***5*** ***4***) ***In the case of sheep, f F***or short periods for shearing; and

(***6*** ***5***) 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 dry matter intake from grazing of not less than 30 percent throughout the ***growing*** ***grazing*** season. Milking frequencies or duration practices cannot be used to deny dairy animals pasture.

(d) Ruminants must be provided with:

(1) A lying area with well-maintained clean, dry bedding, which complies with paragraph (a)(3) of this section, during periods of temporary housing, provided due to temporary denial of pasture during conditions listed in paragraphs (c)(1) through (c)(5) of this section and during the non grazing season;

(2) Yards and passageways kept in good condition and well-drained;

(3) Shade and in the case of goats, shelter open on at least one side;

(4) Water at all times except during short periods for milking or sheering--such water must be protected from fouling;

(***5) Feeding and watering equipment that are designed, constructed, and placed to protect from fouling--such equipment must be cleaned weekly; and***

(6) In the case of newborns, hay in a rack off the ground, beginning 7 days after birth, unless on pasture, and pasture for grazing in compliance with § 205.240(a) not later than six months after birth.

(c) (e) (d) 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*** ***(f) The producer of an organic livestock operation*** must manage outdoor access areas, including pastures, in a manner that does not put soil or water quality at risk. ***This may includes the use of fences and buffer zones to prevent ruminants and their waste products from entering ponds, streams, and other bodies of water. Buffer zone size shall be extensive enough, in full consideration of the physical features of the site, to prevent the waste products of ruminants from entering ponds, streams, and other bodies of water.***

FOOD Farmers comment: Put the below practice standards that have been struck out, plus other potential standards, into guidance.

§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 that meets all requirements of §§ 205.200 - 205.240.

(a) Pasture must be managed as a crop in full compliance with §§ 205.200 through 205.206.

(b) ***The producer must develop and annually update a comprehensive*** ***A*** pasture plan ***for inclusion containing at least the following information must be included*** in the producer's organic system plan, ***which may consist of the***

certifier's farm and livestock questionnaires, and be updated annually when any changes are made. The pasture plan must show the following: ~~***When there is no change to the previous year's comprehensive pasture plan the certified operation may resubmit the previous year's comprehensive pasture plan.***~~

~~***(c) The comprehensive pasture plan must include a detailed description of:***~~

(*1*) ***The types of pasture provided to ensure that the feed requirements of 205.237 are being met;*** ~~***Crops to be grown in the pasture and haymaking system;***~~

(2) Cultural ***and management*** practices ~~***, including but not limited to varying the crops and their maturity dates in the pasture system,***~~ to be used to ensure pasture of a sufficient quality and quantity is available to graze throughout the ~~***growing***~~ ***grazing*** season and to provide all ruminants***, except for exempted classes,*** under the organic systems plan with an average of not less than 30 percent of their dry matter intake from grazing throughout the ~~***growing***~~ ***grazing*** season;

(3) Description of the grazing season. ~~***The haymaking system***~~

(4) The location of pastures ~~***and haymaking fields***~~, including maps ~~***showing the pasture and haymaking system and***~~ giving each field its own identity;

(5) The types of grazing methods to be used in the pasture system;

(6) The location and types of fences, ***except for temporary fences,*** and the location and source of shade and water;

(7) The soil fertility, seeding, and crop rotation systems.

~~***(8) The pest, weed, and disease control practices;***~~

~~***(9) The erosion control and protection of natural wetlands, riparian areas, and soil and water quality practices;***~~

~~***(10) Pasture and soil sustainability practices; and***~~

~~***(11) Restoration of pastures practices.***~~

(***c*** ~~***d***~~) The pasture system ~~***must***~~ ***may*** include a sacrificial pasture for grazing, to protect the other pastures from excessive damage during periods when saturated soil conditions render the pasture(s) too wet for animals to graze; ***and for outdoor access in the non-grazing season***. ~~***The sacrificial pasture must be:***~~

~~***(1) Sufficient in size to accommodate all animals in the herd without crowding;***~~

~~***(2) Located where:***~~

~~***(i) Soils have good trafficability;***~~

~~***(ii) Well-drained;***~~

~~***(iii) There is a low risk of soil erosion;***~~

~~***(iv) There is low or no potential of manure runoff;***~~

~~***(v) Surrounded by vegetated areas; and***~~

~~***(vi) Easily restored.***~~

~~***(3) Managed to:***~~

~~***(i) Provide feed value; and***~~

~~***(ii) Maintain or improve soil, water, and vegetative resources.***~~

~~***(4) Restored through active pasture management.***~~

(e) In addition to the above, producers must manage pasture to comply with all applicable requirements of §§ 205.236 - 205.239.

FOOD Farmers comment: Add the following pasture practice standard to guidance:
At no time during the grazing season, when any class of ruminant receives less than 30% of their dry matter intake from grazing, except for exempted classes, shall the operation mechanically harvest crops from its pastures, showing intent to maximize grazing over other feeding systems throughout the grazing season.

Detailed comments on suggested language changes

Definitions

1. We recommend including a definition for **Class of Animal** to meet the requirements of calculating different levels of feed consumption for livestock of different ages or production.

Suggested wording: **Class of animal: A group of livestock that shares a similar stage of life or production:**

2. **Crop.**

We welcome the inclusion of pastures, cover crops, green manure crops and catch crops to ensure that these are seen as a crop and are therefore subject to the requirements of §205.204. We suggest the removal of sod as we are concerned about the extension of scope of certification to sod farms, which involve removing soil, crop, and organic matter in methods that are likely not sustainable and for which there are no standards/guidance in place. Sod is a landscape material and does not fit within this rule as livestock do not eat sod.

Suggested wording: **Pastures, cover crops, green manure crops, catch crops, and any plant or part of a plant intended to be marketed as an agricultural product, fed to livestock, or used in the field to manage nutrients and soil fertility.**

3. We recommend the inclusion of the following definitions for dry matter and dry matter intake to assist with the calculation of dry matter fed and ensure that calculations are consistently applied to all livestock operations.

Suggested wording:

Dry matter demand: The expected dry matter intake for a class of animal
Dry matter intake: Total pounds of all feed, devoid of all moisture, consumed by a class of animals over a given period of time.

4. **Dry lot.**

We welcome the definition of dry lot based on the industry's use of the term. We suggest that "confined" be replaced by "fenced" to illustrate that the definition refers to a traditional feed lot that is a risk to the environment and the health of the livestock. We suggest the addition of the "little or" to "no" vegetative cover to avoid the manipulation of the language when there are small amounts of vegetation available at certain time of the year.

Suggested wording**: A fenced area that may be covered with concrete, but that has little or no vegetative cover.**

5. **Feedlot.**

We welcome the definition of dry lot and suggest that for the sake of clarity and consistency in the use of terms, the words "confined area" be replaced by "drylot" as described above. Also, "livestock" should replace "ruminant" to reflect the fact that livestock other than ruminants could

be fed in a feedlot (unless changing “ruminant” to “livestock” would be seen as precluding typical outside access areas used for poultry).
Suggested wording: **A drylot for the controlled feeding of livestock**

6. Graze
The definition of graze and grazing is essential for the understanding and implementation of this rule. We suggest that the words “or residual” are added to take into account the common practice of graziers to clip their pasture to increase pasture growth and encourage more vibrant growth from productive vegetation. This addition would also take into account producers who stockpile forage for the winter by not grazing it during the growing season to have winter forage. For those who farm in more arid areas adding “or residual” will take into account those who have rapid growth during one season and have historically cut and windrowed the grass to graze it in place at a later time to extend their grazing season, encourage the growth of productive grasses and maximize the income for their operation. It is important in any final rule that it is clear that pasture grazing means livestock eating vegetation outside on pasture as it is growing or where it was mowed and let lay- not eating foodstuff that was previously harvested from a pasture.

Suggested wording: **(1) The consumption of standing or residual forage by livestock. (2) To put livestock to feed on standing or residual forage.**

7. Growing season
We suggest that the definition for growing season is deleted and the definition of grazing season is added as that can be better defined to take into account the reality of grazing seasons in different areas. Because of the vast differences in climatic conditions across livestock production areas, the growing season can not merely be defined by last and first frosts. The proposed definition does not account for areas, such as arid or hot climates, where part of the time period between frosts is actually a time of limited or no growth which is not suitable for grazing, or areas that experience intense periods of rain that are unsuitable for grazing because of likely damage to pasture stands and soil and water quality. Areas where rainfall and not frost is the limiting factor for forage production should not be exempt from requiring access to pasture and should not be precluded from organic production by standards that were not based on such conditions. Beef cattle production in tropical areas like on the Big Island of Hawaii or the Pantanal in South America may have a year-round grazing period, and not a distinct season. In such ecologically sensitive areas, long-term degradation of biodiversity by overgrazing may be a greater concern than the lack of vegetation. Therefore, it is more appropriate to refer to the ‘grazing season’ rather than the ‘growing season.’ We suggest that wherever the word “growing” is used in the proposed rule, that the word “grazing” be substituted.

8. Grazing season.
Suggested wording**: Grazing season. The period of time when pasture is available for grazing, due to natural precipitation or irrigation. Grazing season dates may vary because of mid-summer heat / humidity, significant precipitation events, floods, hurricanes, droughts or winter weather events. Grazing season may be extended by the grazing of residual pasture as agreed in the operation’s organic systems plan. Due to weather, season, and/or climate, the grazing season may or may not be continuous. Grazing season may range from 120 days to 365 days.**

This definition is written to be applicable across different climatic conditions and includes the aspects of weather that can interrupt or end a grazing season, while defining that grazing season for the purposes of this regulation has a minimum number of days per year. It allows the grazing season to be extended beyond the period of time that plant growth occurs through the grazing of residual vegetation.

One producer/processor in Northern California has suggested that this proposed rule offers only a "one-size fits all" solution to an industry that is regionally diverse in climate, water usage and herd-size, and would make it “virtually impossible” for the Northern California small organic family farms to comply. Other organic dairy producers in the area disagree with him as does the Western Organic Dairy Producers Alliance. The examples below shows how this definition can be applicable to climatically and geographically diverse locations and herds can meet the suggested consumption of pasture with an appropriate stocking rate that meets the capacity and fertility of the pasture and climate. There will be some locations in very arid areas that cannot meet this regulation without irrigation.

Examples of grazing season in various areas are:

California: In warmer ecosystems, the "native" annual range is grazable from February through May most years. Although it is typically germinated in October/November, the plant growth is not significant until soil temperatures rise in the spring, usually February. In cooler climates, like Humboldt County, CA, native feed begins April and goes through September under adequate moisture conditions. The article **“Managers control forage levels and animal performances**”[1] shows the extended grazing offered through irrigated pasture, contrasting regions in CA to coastal and inland New Zealand. Under irrigation, forage production in most of the reported regions in California start in March and continue through September. The article “**Rangeland Management Series - Publication 8018”**[2] published by the University of California and California Rangelands Research and Information Center shows the variability of forage production over the last 20 years in two ecosystems, i.e., the foothills at Sierra Foothill Research Station, and the Central Valley via the San Joaquin Experimental Range Station. The article also provides two years of forage production for Humboldt County, a much wetter/cooler climate. **Cynthia A. Daley, Ph.D., College of Agriculture, California State University, Chico, CA**

Oregon: Grazing season has traditionally been from April 15 through Oct. 15. That would fit all of Oregon, including southern and eastern OR. **Jon Bansen, organic dairy producer, Monmouth, Oregon**

Idaho: In southern Idaho, a conservative estimate for grazing season on irrigated ground is May 1 to October 15. This has been easily met each of the last 15 years. About half of the time we will get an extra 4- 6 weeks, with 2-3 weeks on each end of the season. **David Roberts, organic dairy producer, Preston, Idaho**

[1] Attachment L: “Managers control forage levels and animal performances” by Melvin R. George, Marya E. Robbins, Fremont L. Bell, William J. Van Riet, Gary Markegard, David F. Lile, Charles B. Wilson and Quinton J. Barr

[2] Attachment K: **Annual Range Forage Production**

New York State: The Cornell Dairy Farm Business Summary (which only documents dairy activity) for the past 15 years, states that the average first day of grazing for the state is April 28th. The experienced grazers have enough stored feed to last them through the first week of May since the issue is not when there is enough grass or warm enough but usually the ground is too wet for the cows to be on with out damaging the sod. The average final day of grazing is October 10th. Again it is usually the soil condition that prompts the graziers to remove the animals from the pasture**. Faye Benson, Cornell Cooperative Extension of Cortland County and the Graze NY Program**

"Within New York State the grazing season will vary and in western, southern and central NY, the typical grazing season begins in mid-April and continues until late October or early November, depending on weather conditions. In northern NY, the typical grazing season begins in early to mid-May and continues until early to mid-October, depending on weather conditions…. Predicting the end of the grazing season will be different every year depending on the weather and management of the pastures. In most of NY this will be in late October or early November, and in Northern NY it will be earlier in October in most years." **Karen Hoffman, USDA NRCS,** quoted from article "Transitioning On and Off Pasture**"** [3] which provides some excellent data on the growing season in New York and how to transition from winter diet to pasture.

Northwest Wisconsin: The historical and typical grazing season begins May 1 and lasts until October 15 (5.5 months for our climate). **Greg Andrews (University of WI Extension).**

Northern Colorado: Typical growing season is from April 1 to November 1 (7.0 months), but there is little to graze in July and August heat, when continuous irrigation only keeps the predominant cool season perennial pasture plants alive, but not thriving. The typical grazing season is therefore 5.0 months long. Submitted by **Arden J. Nelson, DVM of Windsor Dairy, LLC, in Windsor, Colorado.**

It is essential that the producer and certifier agree ahead of time what the grazing season is and that it is incorporated within each operation's organic system plan.

9. Inclement weather:

The definition for inclement weather included in the proposed rule was viewed by producers as only dealing with extreme situations that would cause permanent harm or death. Producers have had experience with many weather related situations where the harm to their livestock may not be permanent but can still endanger the welfare or shorten the life of their livestock. Because exact weather conditions and their potential effects cannot be known, producers will have to make the impossible decision of correctly predicting with the proposed definition of inclement weather:

1. Will the wind speed and temperature drop be such over night that cows may suffer frostbite that will cause permanent harm or not?
2. Will a cow slip on that icy patch in the sacrifice pasture and split her legs, damaging her back so that she will never be able to get up again or not?

[3] Attachment M: **Transitioning On and Off Pasture** by Karen Hoffman USDA NRCS

3. Is the temperature and humidity high enough that a dry cow will suffer heat stroke and abort her calf or not, etc.

Having the bar for inclement weather so high that the trigger is potential animal death or permanent damage is not only anathema to the good animal husbandry practices of producers but also ignores the animal welfare concerns of consumers and citizens. If “kill” and “permanent” are not removed from the definition, it will rightly allow criticism of organic standards by non-organic agriculture and animal welfare advocates. We therefore recommend the deletion of the words “permanent” and “kill” and the addition of the sentence that “loss of production or growth rate do not qualify as physical harm” to not allow abuse of a lower bar definition of inclement weather.

Suggested wording: **Inclement weather**: **Weather that is violent, or characterized by temperatures (high or low), or excessive precipitation that can cause physical harm to a given species of livestock. Production yields or growth rates of livestock lower than the maximum achievable do not qualify as physical harm.**

10. Killing Frost:

We suggest the deletion of the definition of killing frost as it is not necessary with the deletion of growing season.

11. Livestock:

We believe it is premature to add “bee” or “colony of bees” and “fish used for food” and therefore suggest the deletion of the words “bee,” and “fish used for food” until such time as a Final Rule is enacted establishing standards for the organic production of such species and systems. The NOSB has adopted recommendations for apiculture and aquatic animals and those recommendations should serve as the basis for future rule making. We would note that the phrase “equine animals used in the production of food, fiber, or feed...” does not mean that non-certified equine animals used for draft purposes are subject to the requirements of this regulation. Such draft equines can be used on organic operations but can be treated as part of a split operation.

Suggested wording: **Livestock: Any cattle, sheep, goat, swine, poultry, or equine animals used for food or in the production of food, fiber, or feed, or other agricultural-based consumer products; wild or domesticated game; or other non-plant life**

12. Residual forage:

We have suggested using the word “residual forage” in the definition of “Graze” and with the use of the word we need to define it. Many operations will employ management practices to maximize the productivity of their pastures which will leave residues for livestock to eat. The most common is clipping pastures to encourage the growth of species which are either more appropriate to the climate, give a higher feed value and to keep the stand in the vegetative stage. Another common management practice in some more arid areas with a short growing season is to cut pasture and leave it in windrows in the pasture to encourage growth of more productive grasses, control weeds and to prolong the grazing season. We strongly advocate for allowing the producer to be able to include historical management practices in their organic system plan which take into account the many pasture management practices used by producers in many locations.

Suggested wording: **Residual forage: Standing forage or forage cut and left to lie in place in the pasture.**

13. Sacrificial pasture:
The use of sacrificial pastures is a pasture management technique that aims to increase livestock access to pasture and can be incorporated on some operations that have the proper soil resources, environmental conditions, and access for livestock. Sacrificial pastures, if managed correctly, will encourage longer pasturing of animals and help close loopholes which may allow farmers to unnecessarily keep their animals off pasture due to wet conditions.

We agree with having the definition within the rule so that this is seen as an acceptable practice We also wish to draw the distinction between a sacrificial pasture and a feedlot as there have been cases of non-compliance where a feed lot is called a sacrificial pasture so there is value in having the clear definition with the words restored to "active pasture management."
We suggest adding "***or where animals are kept in the non-grazing season to provide access to the outdoors"*** as a description of its most appropriate use during the non-grazing season.

However, not all operations have soils suitable to be used during wet conditions or they may have pastures usable as sacrificial pasture during the grazing season but do not have safe or possible access during the non-grazing season. We believe that a sacrificial pasture should not be mandatory and agree with the need to define it so long as "may" governs the use and it doesn't become mandatory. We believe that it gives more opportunity for producers to use this as a management tool if they have the right land and location, increasing the production options for producers.

We suggest the deletion of the sentence "A sacrificial pasture is land used for livestock grazing that is managed to provide feed value and maintain or improve soil, water, and vegetative resources" because a pasture's use as a sacrifice area during wet soil conditions and / or during the non-grazing season no doubt will cause damage to the pasture vegetative and soil resources and feed value in the short term. This damage will then be alleviated when later restored through mechanical and/ or cultural practices.

Suggested wording: **Sacrificial Pasture: A pasture or pastures within the pasture system, of sufficient size to accommodate all animals in the herd without crowding, where animals are kept for short periods during saturated soil conditions to confine pasture damage to an area where potential environmental impacts can be controlled; or where animals are kept in the non-grazing season to provide access to the outdoors. This pasture is then deferred from grazing until it has been restored through active pasture management. Sacrificial pastures are located where soils have good trafficability, are well-drained, have low risk of soil erosion, have low or no potential of manure runoff, are surrounded by vegetated areas, and are easily restored. It is not a dry lot or feedlot.**

14. Shelter:
For clarity of the intention of §205.239(a)(1), we suggest the addition of a definition for a shelter that can be used temporarily during the grazing season and for longer periods of time outside of the grazing season.

Suggested wording: **Structures such as barns, sheds, or windbreaks, or natural areas such as woods, tree lines, or geographic land features that provide physical protection and / or housing to animals.**

15. Stage of life.
Stage of life is used within this rule and discussions amongst stakeholders have raised a number of different suggestions. We have considered wording suggested by ACA: "***Stage of Life.*** A discrete time period in an animal's life which requires specific management practices different than during other periods; such as calves, chicks, etc. Lactation, breeding and other recurring events are not a stage of life." We support this wording but wonder about the conflict with other parts of the rule: "205.239(c)(2) (1) When the animal is segregated for the treatment of illness or injury (the various life stages, such as lactation, are not an illness or injury);" which would need to be changed to "1) When the animal is segregated for treatment of illness or injury (lactation is not an illness or injury);" if the above definition is used.

We suggest the following definition: **Stage of Life: A discrete time period in an animal's life which requires specific management practices different than during other periods; such as: calves, chicks, etc.**

16. Temporary and Temporarily:
We agree with this definition and welcome the clarity it will bring when using these words.

17. Yard / feeding pad:
We suggest the addition of a definition for an area where livestock can be fed, exercised and be provided with outdoor access during the non-grazing season which will be appropriate for both locations that do not need shelter in the non grazing season and for those locations that do need the use of barns and other shelter. We also recognize that livestock may need supplemental feeding during the grazing season and this definition for a yard/permanent feeding pad meets all the requirements of good manure handling and land management. The yard/feeding pad will often be the most efficient and environmentally sound way to provide a cost effective way to feed livestock a balanced ration. Barnyards and concrete feeding pads are an important part of farm operations in the non arid areas, minimizing damage to fields that can happen during wet conditions and high impact activities like feeding. In arid areas, the concrete is not as important, as mud is seldom an issue and the manure dries up quickly after being broken up and dispersed by harrowing the yards. Yards / barnyards are also integral to grazing systems as they serve as the area where lactating animals are gathered and dispersed between the pastures and the milking facility. Parasite management in Mediterranean, tropical and subtropical conditions can be extremely challenging, particularly when synthetic parasiticides are not permitted. Corralling animals for critical host-free periods can be an effective strategy to reduce parasite load in pastures that do not have a winter kill of helminths.

For those not familiar with barnyards or feeding pads, here are a few pictures from Twin Oaks Dairy LLC, Truxton, NY and a description of how these facilities are used. Figure 1 shows some older heifers and dry cows on their feeding pad--a large concrete area that can take the impact of the animals' hoofs and allows for the collection of manure. It is used as the feeding facility for this group of animals in the non-grazing season. The livestock also have free access to a free stall barn, where the water is located, and have access to some sacrifice pasture. Without the feeding pad, the baleage feeders would be on the sacrifice pasture which would become an environment hazard. In the grazing season, these animals are on 100% pasture all of the time except when they are brought into the barnyard for sorting out animals that are getting close to calving, etc.

Figure 1: Feeding pad in winter

Figure 2: Feeding pad and shelter in the grazing season

Figure 2 shows the milking herd barnyard in use during the grazing season, holding half the cows after the herd has been brought in off pasture for milking, while the other half is being milked in the tie stall barn. In the grazing season, they also have access to hay in a feeder, water, salt and minerals in the barnyard and total mixed ration (TMR) in the freestall barn (how much is fed depends on the amount of pasture available--they often only get about 20% of their normal winter time TMR during May, about 50% in August, and 80% in October). After the first group is milked and the groups are switched, the gate to pasture is opened again. When the second group is finished milking, they will be let out to the barnyard too and then all will be taken to pasture until the next milking.

Suggested wording: **Yard/Feeding pad: An improved area for feeding, exercising, and outdoor access for livestock during the non grazing season and a high traffic area where animals may receive supplemental feeding during the grazing season**

§205.236 Origin of Livestock:

We strongly recommend the removal of any consideration of origin of livestock from this rule change and urge the NOP to work diligently to get a proposed rule on origin of livestock published as soon as possible that will stop the continuous transition of conventional animals as dairy replacements.

We do not agree with the new language proposed by the NOP and do not want it to be implemented. We welcome the opportunity to provide the NOP with comments and suggest the following language: "Once an operation has been certified for organic production, all dairy animals born or brought onto the operation shall be under organic management from the last third of gestation."

The preamble of the December 21, 2000 Federal Register National Organic Program Final Rule contains several statements (page 80570) that frame the principles the Rule Writers intended regarding dairy herd conversion and dairy replacement animals, including the following:

- *After the dairy operation has been certified, animals brought on to the operation must be organically raised from the last third of gestation.*
- *The conversion provision also rewards producers for raising their own replacement animals while still allowing for the introduction of animals from off the farm that were organically raised from the last third of gestation. This should protect existing markets for organically raised heifers while not discriminating against closed herd operations.*
- *…a whole herd conversion is a distinct, one-time event…. It is a one-time opportunity for producers working with a certifying agent to implement a conversion strategy for an established, discrete dairy herd in conjunction with the land resources that sustain it.*
- *…the conversion provision cannot be used routinely to bring non-organically raised animals into an organic operation.*

These Preamble statements coalesce to 3 principles:

1. The opportunity for a producer to convert a conventional herd of dairy animals to organic production is a one time event per producer. This is clearly mentioned in two separate statements.
2. Once the operation has been certified, all animals brought onto the farm must be organic from the last third of gestation. This is clearly stated in the first and fourth statements.
3. There is no allowance to move transitioned animals from the operation on which they were transitioned to another certified organic operation. The preamble states specifically that the provisions allow "*for the introduction of animals from off the farm that were organically raised from the last third of gestation*", making no mention of also allowing the introduction of transitioned dairy animals from off the farm.

Using these principles, the answers to questions that have been raised are very evident:

Question: If every animal must be organic from last third, what if a farm goes out of production. Can their transitioned animals be sold as organic?
Answer: No, they cannot be sold as organic. They started their life as non-organic animals and must go back to that status when they leave the farm on which they were transitioned.

Question: Can a person who has already converted one herd convert another herd or be a partner or member of an operation that converts another herd?
Answer: No, conversion is "*a one-time opportunity for producers*". However, a child of an organic dairy producer who converted a herd should not be construed as having exercised the one time option to convert unless they are an adult or a bona fide partner in the operation at the time of conversion.

Question: What about breeder stock? Once breeder stock is on a farm, must it be converted?
Answer: No, breeder stock cannot be converted unless it was on the operation at the time of the start of a producer's one time herd conversion. Any breeder stock brought onto a certified operation will not be able to be converted by that operation and the stock will retain its non-organic status.

FOOD Farmers recommends that the proposed rule on origin of livestock follow these principles that were outlined in the Preamble.

Using these principles to revise the origin of livestock, requiring that all dairy replacement animals be organic from the last third of gestation, would have the following benefits:

1. The standard would meet the requirement of OFPA, would be consistent with the Rule Preamble, would be consistent with the standing NOSB Livestock Committee interpretation, and would be consistent with the public comment received on the topic.
2. The standard would be consistent and fair across the full spectrum of operations, no matter how or when operations transitioned or whether the replacement animals were farm raised or purchased.
3. It will mean that organic dairy animals of all ages will carry a premium price, as should be the case. At this time there is often little, if any premium, in the marketplace for organic dairy livestock and certified organic dairy producers often sell excess youngstock into the non-organic market for lack of an organic market.
4. Requiring that all replacement dairy animals, both purchased and farm-raised, be fed and managed organically will increase the demand for organic feeds, providing a larger market and greater incentive for grain and forage growers to transition to organic production.
5. Certified organic dairy producers would have to buy animals that had been under organic management from the last third of gestation, but could not buy any animals that had been transitioned to organic. This would put all operations on a level playing field, following the same standard.
6. Organic heifer ranches would have to have brood cows that are managed organically during the last third of gestation (3 months) to supply them with calves or buy calves that are organic from the last third of gestation.
7. If the organic market needs more milk, then it would be filled by:
    a) New dairy operations transitioning to organic production
    b) Existing dairy operations expanding through internal herd growth
    c) The purchase of excess last third of gestation stock from other operations or
    d) Non-organic brood cows that are managed organically during the last third of gestation (3 months) to supply organically certifiable calves.
8. On transitioning dairy operations, the first animals that would qualify for sale as organic dairy cattle replacement stock would be those born 3 months (last third of gestation) after the start of 100% organic feeding and management.
9. Requiring organic management of calves supports a "systems" approach to organic dairy production and requires that nutritionists, veterinarians, and producers improve organic calf rearing practices.

We do not request any exemptions to this rule. Some have advocated for transitioned cows and heifers to be sold as organic. Allowing transitioned animals to be sold as certified organic creates a loophole that will be exploited. Transitioned animals are, technically, not organic. A transitioned animal is certified to produce organic milk, but cannot be sold for organic slaughter, and shouldn't be allowed to be sold as an organic dairy animal. If culled from the herd, a transitioned animal should be sold into the conventional market. There will be no decrease in the asset value to the producer as the original value of the livestock was as a conventional animal and the producer has recouped any expense incurred in transitioning to organic certification through the premium received for organic milk produced.

A transitioned animal, by definition, did not have organic management throughout its life. It did not have equal inputs to an animal that was raised on organic feeds and management (virtually always more costly than non-organic inputs) its whole life and therefore should not have as high an economic value as dairy stock that are organic from the last third of gestation. To equate transitioned dairy animals to last third organic animals de-values those animals raised organic from the last third of gestation. It discriminates against the producers who had to invest more money in the raising of the last third of gestation dairy animals and unfairly rewards the producer of transitioned animals. This unfair economic advantage of transitioned animals is what has driven the abuse of the current rule and it will continue to drive abuse of a new rule if the door on transitioned dairy replacement animals being equal to last third dairy animals is not tightly shut.

Tracking of transitioned animals versus last third of gestation animals will require no more record keeping or work for producers or certifiers than should already be done. Organic slaughter stock and dairy stock will become the same category and transitioned dairy animals that will not be able to be sold as either organic slaughter or dairy replacement stock will be tracked separate.

Animal identification lists for all livestock operations are a must and certifiers must be held accountable if they are not requiring such, as we understand has been the case.

If the allowance for breeder stock is retained to enable non-organic breeder stock to be brought onto an organic operation and be managed organically for at least the last third of gestation to provide a source of newborns that would be organic from the last third of gestation, it does raise production difficulties. The breeder stock could not be converted to organic production on a certified organic operation and their milk would not be organic. The newborn could not receive the colostrum from its mother and colostrum is essential to the future growth and health of the calf, especially within an organic system. In order for the calf to retain its organic status, newborns could not be kept with their mothers and provisions would have to be made for alternate milking of the breeder stock animals and disposal of the breeder stock milk through non-organic animals or avenues. The calf would need to be fed with stored colostrum and milk from organic cows.

Our Suggested language for **§ 205.236 (a) (2) (iii): "Once an operation has been certified for organic production, all dairy animals born or brought onto the operation shall be under organic management from the last third of gestation"**

§ 205.237 Livestock feed.

Nature intended ruminants to spend all their time on pasture. It has been human intervention that contrived the unnatural situation for livestock, especially dairy cows, to be kept off pasture and in artificial, human created environments—breeding animals that excelled in high-production/confinement management and on highly processed stored feedstuffs. Nature would assert that ruminants should certainly be on pasture during the full grazing season, when the environmental conditions allow pasture growth, either with natural precipitation or irrigation if rainfall is inadequate. Most organic producers have pasture systems in place which allow them to continue grazing their livestock for a considerable time period after pasture growth has ceased by stockpiling growth and by having adequate acreage in their systems. 120 days should be established as the shortest amount of grazing days allowable—anything less is just too brief to be considered adequate to provide enough of the natural environment for ruminants.

By requiring ruminants to be on pasture, the animals are in their natural environment where they can walk and lay on soft, cushiony ground; harvest food that provides nutritional factors that are lost with machine harvest; and have access to fresh air, sunlight, and freedom to express natural behaviors. Most organic dairy producers have set up their milking systems in such a way that the cows are milked quickly and efficiently and sent out on fresh pasture after each milking. In situations like these, the cows are on pasture for 18 or more hours a day.

There are dairy operations in this country that rely solely on pasture during the growing season and there are a multitude of farms in New Zealand who do as well. Many dairy operations in New Zealand and other temperate areas of the world rely on pasture year round to supply 100% of the cow's intake, other than perhaps salt and some minerals. Studies done by Tilak Dihman at Utah State University show that there is a linear relationship between pasture intake and levels of beneficial fatty acids in milk and meat—the more pasture intake, the higher the levels of beneficial fatty acids like CLA and omega 3 (Dhiman, T.R., et al. 1999. "Conjugated Linoleic Acid Content of Milk from Cows Fed Different Diets." *Journal of Dairy Science* 82:2146-2156).

While science suggests that 100% pasture intake would give the consumers the most nutritional benefit and is the most natural instinct and environment of the dairy cow, the consensus among organic dairy producers (NODPA, MODPA, WODPA, CROPP Cooperative, Horizon Organic, HP Hood, Lancaster Organic Farmers Cooperative, Stonyfield Farm, Humboldt Creamery, Michigan Organic Dairy Producers, Organic Choice, DMS Advisory Committee) and the vast majority of the organic community is that 30% dry matter intake should be the very minimum amount of pasture intake during the grazing season.[4] Most organic dairy producers will supply much more pasture intake than this minimum level.

Like other aspects of the NOP regulations, the 30% figure is <u>not</u> science based. It is the byproduct of a long collaboration between stakeholders in the organic dairy community which resulted in the near consensus of support for the proposed benchmarks and was a compromise from higher proposed DMI levels initially discussed, as is the current practice on most organic farms. The 30% is a number just like all the other numerical parameters in the NOP Rule--a

[4] See letters from major companies advocating for this position as Attachment A:

number has to be picked that makes good, practical sense, but may be somewhat arbitrary as are the following regulation numbers:

- Sodium nitrate restricted to no more than 20% of a crop's total nitrogen requirement.
- Compost: C:N ratios between 25:1 and 40:1; temperature to be maintained between 131F and 170F for 3 days for in-vessel or static aerated pile or 15 days for a window system during which the material must be turned a minimum of 5 times.
- 36 months with no prohibited substances for land prior to organic certification
- 90 days milk withhold after use of Ivermectin
- 7 day withholding of milk after use of lidocaine and procaine for dairy animals, 90 day withholding for slaughter stock
- 90-120 days after application of raw manure before harvest of an organic crop
- 95% organic content for "organic " labeling
- 1 year for the one time transition of dairy animal to organic

On August 16, 2005 the NOSB adopted the following language as guidance: The Organic System Plan should have the goal of providing a significant portion of the total feed requirements as grazed feed but not less than 30% dry matter intake on an average daily basis during the growing season but not less than 120 days per year.[5]

§ 205.237(a)

We welcome the proposed changes by the NOP clarifying that all agricultural components of feed additives and supplements must be organic. We welcome and agree with the clarification of existing requirements concerning all feed fed to organic livestock must be organically certified. The inclusion of this language will level the playing field across the country to the benefit of every producer, whether they have 10 or 2,000 cows. We do not support the use of uncertified feed as feed is an essential factor in the production of milk. This will not be a disadvantage to small exempt operations as the cost of certification is now subsidized by federal cost share programs. The inclusion of this provision will guarantee to the consumer that all feed consumed by organically certified livestock is certified by a NOP accredited third party, thus ensuring the integrity of the Organic seal and the future value-added income to small operations. These changes should be included in the Final Rule.

§ 205.237(b) (7)

We support the inclusion of this language which categorically bans antibiotics in any feed or health care products.

§ 205.237(b) (8)

We recommend that the language here be changed and the words ***withhold, restrain, or otherwise restrict*** be removed as being duplicative.

Our suggested wording for **§ 205.237(b) (8)**: **Prevent ruminant animals from actively obtaining feed grazed from pasture during the grazing season, except for conditions as described under § 205.239(c).**

[5] See Attachment H: NOSB Livestock Committee Recommendation for Rule Change

§205.237(c)
We suggest some significant changes to **§205.237(c)** that will take into account the realities of organic livestock production and not create unnecessary recordkeeping for producers. The proposed language **§205.237 (c) 1-4** should be issued as guidance to assist organic ruminant livestock operations in documenting compliance and to help accredited certifying agents assess compliance. Producers should not have the burden of increased recordkeeping because certifiers do not have the expertise to certify livestock operations. The certifier should be working with the producer to integrate their existing record keeping system into their organic system plan rather than imposing very narrow parameters for measurement of feed intake that may not be relevant to the producer's operation in order to reduce the burden on the producer and to take into consideration the variety of accepted methods for determining dry matter demand and intake.

We suggest adding "residual forage**"** to 205.237 (c) to match the change in definition of graze and adding "This shall be calculated as an average over the entire grazing season for each type and class of animal. The grazing season must be no less than 120 days per year. Due to weather, season, and/ or climate, the grazing season may or may not be continuous." To provide clear direction and enforceable rule language we strongly advocate for the above clear statement requiring that feed consumption is calculated as an average over the entire grazing season.

Attachment B: "Extending the grazing season" by John Cockerall of the University of Wisconsin gives a clear description of the grazing season and how to extend it.

Our suggested wording for § 205.237(c): **During the grazing season, producers shall 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 from residual forage or grazed from vegetation rooted in pasture). This shall be calculated as an average over the entire grazing season for each type and class of animal. The grazing season must be no less than 120 days per year. Due to weather, season, and/ or climate, the grazing season may or may not be continuous.**

§ 205.237(c).1
We suggest adding an exemption from meeting the 30% of dry matter from pasture during the grazing season for organic beef to accommodate the consumer's desire for grain finished meat. This language recognizes the requirements of the market and the producer's need to maximize their profit by receiving top dollar for their meat while not creating a beef finishing lot which the US consumer believes is something that is bad for livestock and the environment. All of the available data, research and comments to the ANPR have a consistent theme of opposing confining livestock and feedlot feeding. [6] The organic consumer is typically well educated and will be paying top dollar for organic beef that they believed spent its life on pasture. The Organic Consumers Association, under a banner headline "**Tell USDA to Close All Loopholes Allowing Organic Dairy CAFOs!"** supported the following wording **"**NOP rules need to be revised to permit grain finishing of beef slaughter stock, such that these animals may be exempt from the 30% pasture DMI requirement during the finishing period, not to exceed 120 days, but must not be denied access to pasture during that period."

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[6] Attachment F: Press Release from Consumers Union and Center for Food Safety, April 2006

Nutritional benefits of products from pasture-raised livestock are also cited in the Addendum. One study found that organic milk was 50% higher in Vitamin E, 75% higher in beta carotene and higher in omega 3 essential fatty acids than conventional milk. This study tied these qualities to organic cows having room to graze and a diet high in fresh grass and clover, and forage and less maize (corn). Intensively pastured cows produced milk with CLA concentrations that were about 3- to 4-fold greater than initial concentrations. Ribeye steaks from cattle finished on a combination of pasture and concentrate were higher in CLA content than steaks from cattle finished on conserved forages plus concentrates.

The NOSB ruled on 2/11/1999 that "Add to the Board recommendation on Confinement of Livestock in an Organic System "stage of production" and "stage of transition of the farm to organic" on the list of exceptions to the requirement that livestock have access to the outdoors**. The management practices must make clear that these additional exemptions in no way change the intent that ruminant organic livestock systems be pasture based."**

In 2005, the NOSB seemingly contradicted that organic systems be pasture based with their recommendation that 120 days confinement be allowed for the finishing of bovines based. This was based on comments received from beef producers who indicated that 120 days is the amount of time needed to achieve "choice" grades of beef. If a 90-120 day exemption from pasture is allowed, some organic production systems would be allowed to keep their organic beef confined for the majority of their life of 18-24 months.

We recommend that before any allowance for the confinement of livestock for finishing is allowed that there is a symposium for all stakeholders to present their position on the issue. The NOSB can then make a recommendation based on a comprehensive study including all stakeholders rather than just beef producers.

We also recommend that an exemption be added from the 30% DMI pasture requirement and pasture access for breeding bulls to reflect the reality that it is illegal in some states to put mature bulls on pasture. However, any such bulls denied pasture access (as per the above recommended requirement for beef slaughter stock) would then no longer qualify as certified organic slaughter stock if they had not been fully managed according to all slaughter stock requirements.

Attachment C: "Does Pasture Finished Beef make the Grade" is a 2008 study by University of Wisconsin that has a bottom line assessment that "Through the use of supplementation, it is possible to produce beef on pasture that will meet commodity market specifications. More time is required to meet these specifications when diets are strictly forage based. The cost of the additional dwell time for the forage-based steers is a trade-off with respect to the added cost of supplementation. But supplementation is a way to stretch pasture, especially during a summer slump in pasture growth."

Attachment D: "Sward Characteristics of Beef Finishing Pasture" a 1996 presentation by Jim Gerrish, F. Martz and V. G. Tate which gives the results of eighty-eight steers who were assigned to four grain feeding levels on pasture with each treatment replicated twice. Observed average daily gains (ADG) were consistent with predicted ADG based on forages plus grain intake levels.

Our suggested wording for **§ 205.237(c).1** is**: Except that, ruminant slaughter stock that are typically grain finished may be exempt from the 30% pasture DMI requirement during the finishing period, not to exceed 120 days, but must not be denied access to pasture during that period; and that breeding bulls may be exempt from the 30% pasture DMI and pasture access, but if denied pasture access cannot be considered organic slaughter stock.**

§ 205.237(c) (2):
The producer has to meet 30% DMI from pasture for ruminants during the grazing season and they need to identify their particular grazing season based on independent data from research where available, historical data from their own operation and anecdotal knowledge from their neighbors. The producer will need to incorporate the definition of grazing season into their organic system plan and the certifier has the role of approving the grazing season and verifying whether or not the 30% is met. This is not overly prescriptive.

We believe that it is already required that organic livestock operations provide their certifiers with complete information on rations for all livestock groups; feed raised, sold and purchased; and that, based on the provided information (confirmed by audit trail and inspection) certifiers should have the expertise to determine whether or not 30% DMI is provided to the various livestock groups during the grazing season of the particular area, which should not be less than 120 days. Certifiers were able to monitor feed consumption when transitioned animals were allowed to use 20% non certified feed and this situation is no different. We recommend the forms developed by Vermont Organic Farmers who have been verifying the 30% DMI for two years and find it is not burdensome for their producers. A quantitative tool of some type is needed to verify that animals on pasture are actually getting a reasonable percentage of their diet from pasture; otherwise access to pasture can become access to dry feed lots.

Some are suggesting that certifiers need only make a visual inspection of operations ("if it walks like a duck and quacks like a duck, then it must be a duck") to determine their ability to provide pasture. We strongly disagree with this approach and do not feel that in itself it will be sufficient to verify that animals are actually receiving a significant portion of their diet from pasture. Animals can be well-fed in the barn before being turned out to fields which then do not appear overgrazed or overstocked. If a farm is deemed noncompliant by slightly failing to meet the 30% requirement, then the producer has the opportunity to rebut the noncompliance by amending the organic system plan so that there is adequate improvement in subsequent seasons. By comparing the animals' rations when they are on pasture, to rations when they are not on pasture, it will not be difficult for certifiers to make an accurate estimate of the difference, the percentage of the diet that comes from grazing.

Good records are a good tool for farmers, and our hope is that the improved livestock Organic System Plan forms that will be developed will improve farmers' ability to profitably monitor their operations while demonstrating compliance.

The certifier needs to know enough about grazing seasons in the areas in which they certify and be able to judge whether the producer is correctly defining their grazing season. The certifier also needs to know enough about livestock nutritional needs and the content of feeds to verify what's being provided through the raised and purchased feed, and the pasture. It is important that the certifiers maintain the responsibilities for verification of dry matter requirements and calculation of dry matter provision for their clients, and provide the resources to their clients to enable them to calculate dry matter requirements and provision as needed. We recommend that a certifier that can't do that, shouldn't be certifying livestock and that accreditation by NOP take into account the certifier's knowledge of livestock, growing conditions and calculating feed values in their accreditation process.

Our suggested language for : **§ 205.237(c) (2) is : Grazing season must be described in the operation's organic system plan and be approved by the certifier as being representative of the typical grazing season duration for the particular area. Certifiers, in reviewing the organic system plan, shall confirm that adequate fields are set aside for pasture to provide grazing for ruminants for the entire grazing season, showing intent to maximize grazing beyond the 120 day minimum. Irrigation must be used as needed to promote pasture growth when an operation has it available for use on crops.**

§ 205.237(c) (3)

There are dairies in locations that have a variable rainfall and are subject to drought on an occasional basis which is difficult to factor into an organic systems plan.[7] There are also years when drought affects areas that usually have adequate rainfall. While producers will know what rainfall amount is likely based on historical data and those with irrigation will be able to plan when to irrigate, there will be years when rainfall cannot be correctly predicted at the beginning of the year in the organic systems plan and drought will derail best laid plans. If the drought conditions become typical rather than atypical, the producer will be required to change their organic systems plan, reduce their stocking rate or incorporate new production management practices. We acknowledge that this conflicts with the language in 205.290, which specifically says that any variances to 205.236-205.239 (which already includes drought, fire, floods, etc) must be granted by the Administrator. We would suggest to the NOP that they develop better procedures for determining/granting timely variances on 120 days or 30% DMI with as much transparency as is legally possible. We hope that the NOP will be willing to consider and grant the kind of variances that we feel are essential, and do it in a timely manner. We are concerned about having different certifiers make differing individual decisions on the significance of producers only reaching 28 or 29% DMI and suggest that the NOP provide strong guidance to certifiers on how to work with producers who might not meet the 30% in an atypical year. The calculations of dry matter are by nature an estimate based on either limited sampling or looking back at what feed has been consumed throughout the year.

Our suggested language for : § 205.237(c) (3) is: In areas where irrigation is not available, certifiers may grant a temporary variance from the 120 days/30% DMI regulation, due to damage caused by atypical drought, flooding, excessive rainfall, or fire, that is experienced during the normal grazing season. Variances are good for a single farm and a producer will only be granted a total of three over a ten year period.

§ 205.237(d):

The suggested language below will provide sufficient information to the certifier to allow them to assess compliance without excessive or burdensome recordkeeping for the producer. There are many ways to measure dry matter intake and dry matter demand which will vary with different

[7] Attachment G: Precipitation graphs for Santa Rosa (CA) from 2005 to 2008

operations and different classes of livestock. This language allows the producer and the certifier to arrive at an acceptable method for year round measurement that fits within their existing management system.

Below is a 2/10/2007 post on Odairy, a NODPA moderated list serve with over 850 members dedicated to organic dairy production, by Sarah Flack, a grazing consultant who works with NOFA-VT and Vermont Organic Farmers (VOF) about her experience and methods of determining DMI.

I spent some time this week looking at what additional info might need to be collected from farmers on the annual organic farm application to be able to more clearly verify DMI from pasture so here are my thoughts on this topic.

Last summer when we (NOFA) were meeting with farmers who were starting their transition to organic, the way I helped them figure out if they were getting 30% DMI from pasture was by asking them what they fed in the summer, and what they fed in the winter. The difference gave us an immediate idea of how much pasture DMI they were getting. In addition to helping us all see how the 30% DMI for 120 days standard can be measured, this was helpful for the farmers because many of them realized that the pasture was a significant part of the summer ration and they needed to switch to a higher energy (and often less expensive) grain.

I studied various methods of DMI estimating in grad school when we were studying dairy grazing. There are a lot of ways to measure DMI on pasture, but the key in this issue now is to find a way which is practical for an inspector and certifier to be able to use. Many times when you visit a farm it is obvious that a farm is meeting 30% DMI during the grazing season because they feed little or no stored forage during most of the grazing season - so most of the DMI is obviously from pasture. In those cases where it isn't obvious that most of the DMI is coming from pasture then calculating pasture DMI using the "subtraction" method seems to be easiest (winter ration fed in barn (lbs DM per cow) minus summer ration fed in barn = dm from pasture). This may require some certifiers to collect more detail on their application about the average winter ration and the average summer ration. This information on the average DM fed per cow in the barn in the winter compared to in the summer is relatively easy to collect when compared to actually trying to estimate the DM in the pasture accurately and practically (although it can be done... I just don't think that's the route to take).

We have had to do 80/20 calculations which were often even more complicated (on an as fed basis), as well as collect enough info to do a feed audit, so I am sure that inspectors and certifiers will be able to do these winter and summer DMI calculations too... its just a matter of getting the info needed from the farmer with the least hassle for all involved. The first challenge is that we now have to convert over to thinking in DM instead of as fed (we had to do as fed for the 80/20). So all the feed (grain and stored forages) needs to be converted to a dry matter basis. Not all farmers test their forages so this may sometimes require working with some average DM numbers for hay or haylage or silage. There were a couple of worksheets circulated last spring/summer to do these calculations, and as they get revised some more they might be helpful. Any farmer who is working with a nutritionist to develop a ration will have that information already available on a dry matter basis. The challenging part that I've run into *so far is that different farms track their feed somewhat differently, but then this has been true all along while we were trying to do feed audits and 80/20 calculations. There are other methods that inspectors and certifiers can use to back up or check their calculations which would involve some pasture DM estimating (if the pasture isn't under the snow), but these are not as practical to use regularly I think. There are also some methods we can use to see if the total DMI numbers we are coming up with for a farm are in the ballpark of what we'd expect a cow to be eating. For example... 3% of bodyweight in DMI is often used... this varies with stage of production but can help with double checking your calculations.*

Our suggested language for **§ 205.237(d): Producers shall:**
(1) Describe the total feed ration for each type and class of animal;
(2) Document changes that are made to all rations throughout the year in response to seasonal grazing changes;
(3) Provide the method for calculating dry matter demand and dry matter intake to certifier for approval.

§ 205.238
Livestock health care practice standard. We suggest adding the following language to this section as it is an unfortunate omission in the current language:
§ 205.238 (b): When preventive practices and veterinary biologics are inadequate to prevent sickness, a producer may administer non-synthetic substances provided they are not prohibited under 205.604. In addition a producer may administer synthetic medications: Provided, that, such medications are allowed under §205.603….

§ 205.239 Livestock living conditions.
The proposed changes to this section provided the most challenge to producers as was evident with the many comments at the listening sessions. Year round access to pasture is difficult and / or unworkable for the majority of organic livestock producers.

§ 205.239 (a) (1)
We agree with the need to establish and maintain year round livestock living conditions as described in § 205.239 (a) but recommend striking "**Further, producers shall not prevent, withhold, restrain, or otherwise restrict animals from being outdoors, except as otherwise provided in paragraph (b) and (c) of this section"** as too prescriptive and not recognizing the realities of organic dairy production and management systems where livestock may not have continual access to the outdoors at all hours of the day and night.

In § 205.239 (a)(1) we strongly support year round access for all animals to the outdoors with sufficient shade, shelter and fresh air and water for drinking and the change of "stage of production" to "stage of life." We recommend specifying "clean" water to simplify the regs and alleviate the need to again mention providing water as described in **§ 205.239 (d)(4),** as well as to make "clean" water required for all livestock, and not just for ruminants. We suggest striking "(indoors and outdoors)" where it references providing water for drinking as it is overly prescriptive and burdensome to producers and does not take into account the extreme variations in operational management, layout of the farm operations, and low wintertime temperatures in many areas. In some climates it is physically and economically impossible to provide water at all times outside, or not a common practice to provide it outdoors for species like poultry.

We suggest adding "**except as otherwise provided in paragraph (b) of this section"** to recognize that there are exemptions from the requirement for outdoor access which allow temporary confinement and the providing of shelter**.** We suggest re-phrasing "Dry lots and feedlots are prohibited" to "**Continuous, total confinement in dry lots and feedlots is prohibited"** to acknowledge the fact that it is the practice of total confinement that is being outlawed, recognizing that some very well managed organic grazing operations do currently supplement feed their livestock in what have been called 'feedlots' during the grazing season or during the non-grazing season. It additionally emphasizes the need for access to pasture and acknowledges the overwhelming support by consumers, producer and processors that organic livestock not be confined to feedlots or drylots.

Our suggested language for **§ 205.239 (a)(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 as otherwise provided in paragraph (b) of this section. Continuous, total confinement in dry lots and feedlots is prohibited.**

§ 205.239 (a) (2)

In § 205.239 (a) (2) we disagree with continuous year round management on pasture as it is very inappropriate as a universal standard. It will at times conflict with the protection of pasture vegetation stands, NRCS nutrient management plans, animal welfare, and can lead to soil compaction and soil and water quality management issues. We suggested striking the words "**continuous year-round management on pasture"** and replace it with "**provision of pasture throughout the grazing season to meet the requirements of 205.237."** We also suggest striking "**for: (i) Grazing throughout the growing season; and (ii) Access to the outdoors throughout the year, including during the non-growing season. Dry lots and feedlots are prohibited**," as this is dealt with elsewhere.

We suggest § 205.239 (a) (2) should read: "**For all ruminants, provision of pasture throughout the grazing season to meet the requirements of 205.237, except as otherwise provided in paragraph (c) of this section."**

§ 205.239 (a) (3)

We thank the NOP for addressing this issue of bedding which is widely interpreted in different ways by producers, inspectors and certifiers. We welcome the opportunity to suggest wording that will be clear and allow for universal interpretation of the standard while acknowledging different production systems.

As there are a multitude of different plant based materials used for bedding, we suggest striking the examples of bedding as it's not possible to name them all. By only naming a few examples in the rule it could be more confusing as to which materials will need to be certified organic. We suggest striking the words "**hay, straw, ground cobs, or."** We strongly encourage the NOP to actively educate certifiers and producers that these three listed materials are widely fed in ruminant livestock rations so are clearly not allowed as bedding unless certified organic We suggest adding the words "**Genetically modified crop matter must not be used as bedding;"** to eliminate any doubt about some of these materials, address some non-compliance issues and illustrate the need for certifiers to know the source of all bedding materials. We recognize that in some areas there is limited certified organic straw available but in other areas it is sold into the conventional market for lack of organic buyers. Requiring straw to be organic will be a boon to organic crop growers who currently have no organic market and will help drive the increased organic production of small grains to supply the increased need. Also, many producers whose certifiers do not allow conventional straw to be used, now purchase low quality organic hay to use as bedding and /or certify marginal land to harvest hay for bedding. There also are non plant materials that can be used for bedding such as sand. **We do not recommend any commercially available exemption clause as this will create many opportunities for abuse of high standards.**

We suggest that the wording for **§ 205.239 (a)(3)** should read**: Appropriate clean, dry bedding. When crop matter typically fed to the animal species is used as bedding, it must comply with the feed requirements of §205.237. Genetically modified crop matter must not be used as bedding;**

§ 205.239 (a) (4)
We agree with the need to supply shelter and wish to add the words "**as needed and appropriate to the species"** to clarify that shelters will vary in size and sophistication depending on which species is being housed, the climate, and the reason for housing, and to acknowledge that for some species in some locations, no shelter is needed. Francis Thicke, an organic dairy farmer from Iowa shares these personal production practices "Basically, at wind chills of less than 0 degrees F. there is little danger of frozen teats. From 0 to -25 degrees wind chill, there is an increasing danger of frozen teats. Below -25 wind chill, frozen teats will occur if exposed for any significant length of time. A basic rule of thumb I have used for outwintering cows is that if both the air temperature is less than 10 degrees and the wind speed is more than 10 mph I need to provide some shelter to prevent frozen teats."

We suggest the proposed **§ 205.239 (a) (4) section should read: Shelter, as needed and appropriate to the species, 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;

§ 205.239 (a) (5)
We suggest moving **§ 205.239 (d)(2)** to **§ 205.239 (a)(5)** as more appropriate to this section. We suggest the addition of "feeding pads" to give a comprehensive list of livestock areas that need to be kept in good condition and be well drained. We suggest the substitution of lane for passage as that wording is more commonly used in livestock farming.

Our suggested new wording **§ 205.239 (a) (5): Yards, feeding pads, and laneways kept in good condition and well-drained;**

§ 205.239 (b)
This section deals with conditions which are required to provide temporary confinement and shelter exemption from access to the outdoors. We suggest the following changes:

1. Deleting "non-ruminant" from "non-ruminant animal" to allow the exemptions for all livestock, including ruminants. There are times when ruminants clearly need exemption for inclement weather (i.e. hail, thunderstorms, hurricanes, tornadoes, excessive heat and / or humidity, freezing temperatures, etc.), conditions under which the health, safety, or well being of the animal could be jeopardized (i.e. ice, deep snow, a known predator close by, etc.), and risk to soil and water quality (i.e. after large amounts of rain, after an atypically early or late snowstorm on unfrozen ground, flooded conditions, etc.) as do non-ruminant animals.

2. The insertion of "**provide temporary confinement"** and the striking of "**temporarily deny a non-ruminant animal access to the outdoors"** and the addition of **"and shelter for an animal."** The new wording more accurately reflects the requirement of the exemptions for animals which may need both confinement and shelter for their welfare.

3. We suggest inserting "**and conditions caused by inclement weather"** after inclement weather as sometimes the residual effect of the weather is as a great concern as the weather itself, such as ice left after the storm, even though the sky has turned blue and the wind has died.

4. The proposed rule changed "stage of production" to "stage of life" is welcomed but would add the qualifier "**Lactation is not a stage of life that would exempt ruminants from any of the mandates set forth in this regulation"** to preclude the potential for abuse of the stage of life exemption, as the NOP has declared lactation a stage of life via the text in 205.230(c)(1) "the various life stages, such as lactation, are not an illness or injury".

We suggest the new wording for **§ 205.239 (b)** should be**: The producer of an organic livestock operation may provide temporary confinement and shelter for an animal because of:**

> **(1) Inclement weather and conditions caused by inclement weather;**
> **(2) The animal's stage of life. 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; or**
> **(4) Risk to soil or water quality.**

§ 205.239 (c)
This section prescribes the conditions where the ruminant livestock may be temporarily denied pasture. We suggest adding "or outdoor access" as sometimes livestock might need to be confined for their own health or welfare.

Suggested wording for **§ 205.239 (c): The producer of an organic livestock operation may temporarily deny a ruminant animal pasture or outdoor access under the following conditions**:

§ 205.239 (c) (1)
We suggest adding **"for the day of breeding or for preventive health care practices, or for the"** as these are regular management tasks that may require temporary confinement of livestock.

Our suggested new wording**§ 205.239 (c) (1**): **When the animal is segregated for the day of breeding or preventive health care practice, or for the treatment of illness or injury (the various life stages, such as lactation, are not an illness or injury);**

§ 205.239 (c) (2)
We suggest adding **"one week at the end of a lactation for dry off, three weeks prior to parturition"** to allow the producer to implement effective preventive care of livestock at these critical times in the lactation. Additionally, three weeks prior to parturition gives leeway for times when the actual date of parturition varies from the expected due date, as it often does for livestock just as it does for humans. Three weeks is enough to adapt the rumen papillae and the rumen microflora to a lactating diet that is higher in grain to facilitate maximizing dry matter intake after calving. Three weeks also allows for the use of Dietary Cation-Anion Difference (DCAD) science in ration formulation for cows prior to parturition. It has been shown that while 7-10 days is adequate time for the anionic ration to affect calcium metabolism and protect the cow from milk fever and the associated diseases of the sub-clinical hypocalcemia complex, less than three weeks is insufficient for the average cow due to our inability to predict accurate gestation length in individual cows. Cows with twins, heat stress, cold stress, and/or nutrition stress will calve early, sometimes by as much as 14 days. Cows may calve up to 14 days late when cow health and fetal health are excellent, and environmental stresses are minimized.

DCAD science is of extreme importance to cow health post-partum for many reasons, all related to the anionic ration's ability to induce calcium mobilization from the bone bank of calcium prior to calving. Many injuries (posterior paralysis due to pressure necrosis to muscle and nervous tissue, stepped on teats resulting in loss of teat, teat function, or facilitation of mastitis) and or death can be sequelae to clinical milk fever. Clinical milk fever has been shown to occur in an average of 4.7% of all calvings, increasing to 15% of cows that are 5th lactation or older, and peaking at over 34% for cows in 11th lactation. Milk fever has been shown to be linked to higher incidences of dystocia (7.2 x), retained placenta(4.0x), metritis(4.9x), cystic ovaries(3.9x) ketosis(23.6 x), mastitis(5.4x), displaced abomasums(4.9x) and culling(3.7x). Dietary control of milk fever is of paramount importance to the pre-partum cow's subsequent health and herd longevity, and is especially needed when pastures or forages are high in potassium or low in chloride.

Allowing three weeks to ensure the ability of dairy producers to employ nutrition science that aids dramatically in maintaining the health and well-being of the cow after parturition is a very minimal length of time invested compared to the six *month* exemption that we all agree is a necessary allowance for newborns.

References:
1. Curtis, Erb, Sniffen, Smith. JDS. 1984. 67:817-825.
2. Curtis, Erb, Sniffen, Smith, Kronfeld. JDS. 1985. 68:2347-2360.

Our suggested new wording **§ 205.239 (c) (2): One week at the end of a lactation for dry off, three weeks prior to parturition (birthing), parturition, and up to one week after parturition;**

§ 205.239 (c) (3)
We suggest adding **"during the grazing season"** after the word pasture to bring this section for youngstock in synchrony with our recommended change in 205.239 (a)(2) to only require management on pasture during the grazing season. We agree with the prohibition on individual housing (except for individual segregation during treatment for illness or injury as allowed in 205.236(c)(1)) for youngstock after six months of age and agree that youngstock after six months of age must be on pasture during the grazing season.

Our suggested new wording for **§ 205.239 (c) (3): In the case of newborns for up to six months, after which they must be on pasture during the grazing season and may no longer be individually housed;**

§ 205.239 (c) (4):
We suggest deletion of this subpart: In the case of goats, during periods of inclement weather, as it's been dealt with above at § 205.239 (a) (4).

§ 205.239 (c) (5):
We suggest the deletion of "In the case of sheep" as sheep are not the only animals sheared. It should be open to other ruminant livestock species that may be sheared, for example yaks, goats, llamas and alpacas.

Suggested wording for **§ 205.239 (c) (5): For short periods for shearing: and**

§ 205.239 (c) (6) we have only one suggested change to strikeout **"growing"** and replace it with **"grazing"** for season.

§ 205.239 (d)
We suggest the deletion of **§ 205.239 (d) (1) through (6)** as these conditions are covered elsewhere or can be included as guidance. 205.239(d) is redundant to livestock living condition requirements already outlined in 205.239(a) and (c). Each subpart is already addressed elsewhere in the rule. 205.239(a) (3) requires clean dry bedding. We have recommended moving (d) (2) to 205.239(a) (5). 205.239(a) (1) requires shade. 205.239(a) (1) as amended requires clean water. 205.239(c) (3) as proposed requires newborns to be on pasture after six months of age. The proposed text of the final subpart (6) is overly prescriptive by requiring hay at 7 days and does not allow producers to implement animal husbandry practices tried and tested at their individual operations.

§ 205.239 (e and f)
We feel this section is too prescriptive and could conflict with the requirement of local agencies. The management of manure is legally prescribed in many different ways depending on the State and/or Federal agency. Many producers are already enrolled in an NRCS manure management

plan whose standards vary depending on location, soil type and other local conditions. It is also a prerequisite for organic certification that the producer manage their operation to not put soil and water quality at risk. The use of the word buffer here is confusing as its use within organic certification is defined as the distance between certified and non certified land. We suggest that the wording from **§ 205.239 (f)** "must manage outdoor access areas, including pastures, in a manner that does not put soil or water quality at risk" be merged with § 205.239 (e) to become the new (d) and the rest of (f) "This may include the use of fences and buffer zones to prevent ruminants and their waste products from entering ponds, streams, and other bodies of water. Buffer zone size shall be extensive enough, in full consideration of the physical features of the site, to prevent the waste products of ruminants from entering ponds, streams, and other bodies of water," be deleted**.**

Our suggested wording for **§ 205.239 (e)** which becomes **(d): 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 outdoor access areas, including pastures, in a manner that does not put soil or water quality at risk.**

§205.240 Pasture practice standard.

We have heard from producers and certifiers that, in the absence of an Organic Best Management Practices for Ruminant Livestock Operations manual, they would appreciate some prescription within this rule to help guide them in their work. For that reason we support the retention of this section with some editing.

We strongly support the wording in the Proposed Rule for **§205.240** and **§205.240 (a)**

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 that meets all requirements of §§ 205.200 - 205.240.

(a) Pasture must be managed as a crop in full compliance with §§ 205.200 through 205.206.

§205.240 (b)

This subpart supports the need to have a pasture plan within the organic system plan and our suggested language will allow more flexibility in how the producer works with the certifier to supply enough information and data to be in compliance.

Suggested language for **§205.240 (b**): **A pasture plan containing at least the following information must be included in the producer's organic system plan, which may consist of the certifier's farm and livestock questionnaires, and be updated annually when any changes are made. The pasture plan must show the following:**

§205.240 (c)

We suggest the deletion of line (c) and subparts to (c) will end up as subparts to (b) with revisions as suggested below.

§205.240 (b)(1)
We suggest the addition of the following language as defining what needs to be in the pasture plan and to emphasize that the pasture must meet all the requirements of the Livestock Feed section.

Suggested language for **§205.240 (b) (1): The types of pasture provided to ensure that the feed requirements of 205.237 are being met.**

§205.240 (c) (2) becomes §205.240 (b) (2)
We suggest some changes to the wording of this subsection to provide clarity without too much prescription.

Suggested wording for **§205.240 (b) (2): Cultural and management practices to be used to ensure pasture of a sufficient quality and quantity is available to graze throughout the growing grazing season and to provide all ruminants, except for exempted classes, under the organic systems plan with an average of not less than 30 percent of their dry matter intake from grazing throughout the grazing season;**

§205.240 (c) (3)
Delete this subsection as detailed information about the haymaking system is not a necessary part of a pasture plan and the information will be found elsewhere in the organic systems plan.

Delete: **The haymaking system**

§205.240 (b)(3)
The basis of the pasture plan is the grazing season and we recommend that a clear description of the grazing season expected for the operation is an essential part of any plan.

We suggest the following new language as **§205.240 (b) (3): Description of the grazing season.**

§205.240 (b) (4)
This subsection prescribes how much information is required in a pasture plan to show where pastures are located and their size to enable a certifier to assess the livestock carrying capacity of the operation. We have deleted information that is recorded elsewhere in the organic systems plan and does not relate directly to a pasture plan.

We suggest the following amended language for **§205.240 (b) (4): The location of pastures, including maps giving each field its own identity;**

§205.240 (c) (5) becomes §205.240 (b) (5)
We support the retention of this subsection without amendment.

§205.240 (c) (6) becomes §205.240 (b) (6)
We support the retention of this subsection, with the exception for temporary fences, some of which are moved on a daily basis or multiple times a day in some grazing systems.

We suggest the following amended language for **§205.240 (b) (6): The location and types of fences, except for temporary fences, and the location and source of shade and water;**

§205.240 (c) (7) becomes §205.240 (b) (7)
We support the retention of this subsection without amendment.
(7) The soil fertility, seeding, and crop rotation systems.

We recommend that §205.240 (b) 8-11 be deleted from the rule as (8), (9), and (11) should be covered in the organic systems plan annual updates via pasture now being considered a crop. We recommend the deletion of (10) as its meaning is unclear

For more information on designing and laying out a pasture system please see **Attachment J: Grazing Systems Planning Guide by** Kevin Blanchet, University of Minnesota Extension Service; Howard Moechnig, Natural Resources Conservation Service Minnesota Board of Water & Soil Resources and Jodi DeJong-Hughes, University of Minnesota Extension Service.

§205.240 (d)
There are many producers who view and use sacrificial pasture as an acceptable practice so long as it's not detrimental to soil and water and fits within their NRCS management plan. Those producers who use sacrificial pasture will return this land to a crop / pasture as part of their rotation and / or pasture renovation plan. We believe that it gives more opportunity for producers to use this as a management tool if they have the right land and location, increasing the production options for producers.

Francis Thicke, organic dairy farmer from Iowa, shares his experience on sacrificial pasture, "*For out-wintering, we put round bales (baleage or day hay) in round-bale-feeder rings in selected paddocks starting in the back of the paddock. Each time we bring new bales out we set them further down the paddock. That spreads the manure across the paddock better and prevents mud holes from developing. When it snows we unroll round bales of straw or old hay out for the cows to lie on using a bale un-roller on the back of a tractor. The residual hay from the feeder rings also makes good bedding. (That also helps to protect water quality because the cows drop much of their manure on the bedding when they get up from lying down.) In the spring we use a front-end loader to push the residual hay and bedding (and manure that landed on the bedding) into piles for composting. We turn the compost piles a few times and then haul it to other locations for spreading so we don't get too much nutrient accumulation in the out-wintered paddocks. We then till the paddock and plant a summer annual like BMR sorghum/sudan grass, which works well because it has a late planting date, which gives us time to compost the residual. The next year we plant a perennial mix of grasses and clovers. We rotate paddocks for out-wintering.*

We reserve a paddock in a low-lying area, sheltered by trees, for times when the wind chill is too high to put the cows in the regular, more exposed, out-wintering paddock."

However, requiring each and every organic livestock producer to have sacrificial pasture that meets all of the characteristics as defined would be contradictory to the basic tenants of organic production outlined in 205.200 and is untenable. We believe the same consumers who envision a pasture-based system would agree that forcing producers to destroy part of their operation in order to leave animals on pasture during conditions not conducive to pasturing in the first place is inappropriate and unrealistic. This subpart may also contradict local government body regulations regarding soil and water quality in some locations.

We believe that sacrificial pasture should not be mandatory and strongly urge that the word “must” be deleted and the word “may” be inserted. So long as “may” governs the use and it doesn’t become mandatory we support the inclusion of this provision. We suggest adding **“or where animals are kept in the non-grazing season to provide access to the outdoors”** as a description of its appropriate use during the non-grazing season. We suggest deletion of the subparts (1), (2), and (4) as they are duplication of what is already included in the definition of sacrificial pasture, and deletion of (3) as those provisions will often be contradictory and not achievable in the short term given the conditions that sacrifice pasture is used under (i.e. with the known purpose that the vegetative cover may be sacrificed).

Suggested language for§205.240 (d): **The pasture system may include a sacrificial pasture for grazing, to protect the other pastures from excessive damage during periods when saturated soil conditions render the pasture(s) too wet for animals to graze; and for outdoor access in the non-grazing season.**

§205.240 (e)
We welcome the inclusion of the existing language in the proposed Rule: In addition to the above, producers must manage pasture to comply with all applicable requirements of §§ 205.236 - 205.239.

§ 205.290 Temporary variances.
We support this as written although we would welcome more timely and transparent decision making on allowing variances which included greater coordination between certifiers and the Administrator about atypical environmental and weather conditions that dramatically affect pasture growth.

We recommend the following be put in a guidance document or in an "Organic Best Management Practices for Ruminant Livestock Operations" to assist producers and certifiers with their interpretation of the rule.

§ 205.239 Livestock living conditions Guidance

Ruminants must be provided with:

1. A lying area with well-maintained clean, dry bedding, which complies with paragraph 205.239(a)(3) during periods of temporary housing, provided due to temporary denial of pasture during grazing and during the non grazing season;
2. Feeding and watering equipment that are designed, constructed, and placed to protect from fouling--such equipment must be cleaned as needed.
3. In the case of newborns, forage beginning 7 days after birth, unless on pasture, and pasture for grazing in compliance with § 205.240(a) not later than six months after birth.

The producer of an organic livestock operation must manage outdoor access areas, including pastures, in a manner that does not put soil or water quality at risk. This may include the use of fences and filter strips to prevent ruminants and their waste products from entering ponds, streams, and other bodies of water. Filter strip size shall be extensive enough, in full consideration of the physical features of the site, to prevent the waste products of ruminants from entering ponds, streams, and other bodies of water.

§205.240 Pasture practice standard Guidance:

At no time during the grazing season, when any class of ruminant receives less than 30% of their dry matter intake from grazing, except for exempted classes, shall the operation mechanically harvest crops from its pastures, showing intent to maximize grazing over other feeding systems throughout the grazing season.

Pasture Plan Guidance:

In addition to §205.240 (b), the comprehensive pasture plan must include a detailed description of:

1. The pest, weed, and disease control practices;
2. Forage conservation
3. The erosion control and protection of natural wetlands, riparian areas, and soil and water quality practices; and
4. Restoration of pastures practices**.**
5. When there is no change to the previous year's comprehensive pasture plan the certified operation may resubmit the previous year's comprehensive pasture plan.

§205.240 (d): Sacrificial Pasture Guidance

A sacrificial pasture must be:

1. Sufficient in size to accommodate all animals in the herd without crowding;
2. Located where:
   - (i) Soils have good trafficability;
   - (ii) Well-drained;
   - (iii) There is a low risk of soil erosion;

(iv) There is low or no potential of manure runoff;
(v) Surrounded by vegetated areas; and
(vi) Easily restored.

3. Managed to provide feed value when used during the grazing season and.
4. Restored through active pasture management.

Guidance for § 205.237
Measuring Dry Matter—One Possible Method:
(1) Document each feed ration (i.e., for each type of animal, each class of animal's intended daily diet showing all ingredients, daily pounds of each ingredient per animal, each ingredient's percentage of the total ration, the dry matter percentage for each ingredient, and the dry matter pounds for each ingredient) as it changes throughout the year;
(2) Document the daily dry matter demand of each class of animal using the formula:

- Average Weight/Animal (lbs) × X = lbs DM/Head/Day × Number of Animals = Total DM Demand in lbs/Day where:
  a) X=.035- .04 for lactating dairy cows,
  b) X=.02-.025 for dry dairy cows and dairy youngstock,
  c) X=.025 for lactating beef,
  d) X=.02 for non lactating beef,
  e) X=?? for goats, sheep, wild game;

(3) Document how much dry matter is fed to each class of animal in all rations; and
(4) Document the percentage of dry matter fed in all rations to each class of animal using the formula: (DM Fed ÷ DM Demand in lbs/day) × 100 = % DM Fed.

National Research Council (NRC) tables for dairy says: "DMI ranges from 2.25 % of live weight at 52 percent digestibility to 4.32 % of live weight at 75 % digestibility". If we presume feeds are greater than 70% digestible, than the 4% DMI for lactating milk cows is justified.

Plugging in numbers for an operating farm:
From the formula: 1350 lbs average weight/lactating animal x .04 = 54 DM Demand in lbs/Day So that means our lactating cows should be eating 54 lbs of DM daily. If we are feeding a ration with the following components / cow: 55 pounds of haylage at .38% DM (55 x .38=20.9 lbs DM), 10 lbs high moisture shell corn at .75 DM (10 x .75=7.5lbs DM), 3 lbs of wheat midds at .88%DM (3x.88=2.64 lbs DM) for a total intake of 31.04 lbs of DM from fed feeds. Therefore, take the DM demand of this class of animal at 54 lbs/day and subtract the DMI from fed feeds of 31.04 to come up with 22.96 lbs coming from pasture. 31.04lbs of DM from fed feeds divided by 54 lbs = 57.5 % of ration is from fed feeds.

Attachment E: Food Farmers report on measuring Dry matter

Attachments L: "Managers control forage levels and animal performances" by Melvin R. George, Marya E. Robbins, Fremont L. Bell, William J. Van Riet, Gary Markegard, David F. Lile, Charles B. Wilson and Quinton J. Barr shows a feed budgeting example for pasture in California.

Attachment A: History of NODPA's advocacy work and supporting letters from processing companies.

History of this initiative

The advocacy work that NODPA and FOOD Farmers have been doing to get the access to pasture and origin of dairy livestock rule moving stems back to a meeting in June 2007 in Boulder between producers and processors. After the meeting, NODPA kept going back to all the different companies to publically work with us in DC to push the issues forward. The only company to respond with the promise of active cooperation was WhiteWave Foods and so NODPA worked with them and the National Organic Coalition since the end of 2007. Through its membership of the National Organic Coalition (NOC), NODPA worked with NOC and Whitewave to set up meetings and advocate for the producer/processor/ngo position with USDA We welcomed other companies to work with us, or ask their lobbyist to work with us but they preferred to work separately or with other coalitions.

One of those meeting that was organized by WhiteWave Foods was as the Farm Bill was being debated and the Pope was visiting Washington. Kelly Shea (Horizon Organic), Steve Etka (National Organic Coalition) and Ed Maltby were able to meet with Bruce Knight (Under Secretary for Marketing and Regulatory Programs), J. Burton Eller, Jr. ,(Deputy Under Secretary for Marketing and Regulatory Programs); David Shipman (Associate Administrator for AMS) and Richard Mathews (NOP) for 45 minutes to discuss the clarification of the access to pasture rule and the proposed origin of livestock and cloning rule.

We were able to provide a unique presentation to the Under Secretary of all sides of the industry (processors, farmers and non-profits) with a unified position on the two priorities for the organic community, the immediate publication of the access to pasture rule and the publication of a rule (rather than an ANPR) for the origin of livestock and cloning. We discussed the need for the two rules to be published quickly in order to create a level playing field by having a clear definition of the minimum requirements for grazing and one easily understood rule for organic dairy replacements, rather than the many confusing criteria we have now. We explained the very real financial hardship that farmers are suffering and the need to show the consumer that the organic seal is strong and will be defended.

After that meeting NODPA joined with NOC and WhiteWave to encourage other processors to join with us and send letters of support for our joint position. FOOD Farmers also encouraged the other companies to support the FOOD Farmers position by writing letters of support. Below are those letters of support.

The grazed feed must provide significant intake for all milking-age organic dairy cows. At a minimum, an average of 30% of the dry matter intake each year must come from grazed pasture during the region's growing season, which will be no less than 120 days per year.

Letters from:

- **a) Organic Valley, Humboldt Creamery and Stonyfield Farm**
- **b) Upstate Niagara Cooperative**
- **c) HP Hood LLC**
- **d) Organic Dairy Farmers Cooperative Inc.**
- **e) Organic Choice**
- **f) Pastureland Cooperative**

May 28, 2008

Under Secretary Bruce Knight
Under Secretary for Marketing and Regulatory Programs
U.S. Department of Agriculture
1400 Independence Ave., S.W.
Washington, DC 20250

Dear Under Secretary Knight;

For the past six years, CROPP Cooperative, Stonyfield Farm and Humboldt Creamery Cooperative have used the USDA Organic Seal and certification program on our cartons and packaging, and this partnership with the USDA has been very successful. Although not the only factor, the National Organic Program certainly has been a large part of the incredible growth each of us has experienced in the last few years. Consumers who see the seal on the packaging are confident that the product has been produced in accordance with the organic standards.

Maintaining the consumers' and producers' confidence is critical, as you well know. With any industry, there are always challenges to the consumers' confidence in a product, and those challenges must be met. In the organic industry, because of the high standards, and the ideals around organic, there seems to be an abundance of these challenges, for better or worse.

We are seeking your continued assistance in meeting these challenges. Whether through class action lawsuits, state regulations, or standards questions, the challenges come in many shapes. We urge the USDA to protect the organic certificate when it is challenged, and by supporting the strength and meaning of that certificate, consumers can continue to have confidence that it represents the strongest certification program in the world.

Recently, we understand you have been asked by NODPA, NOC, and Whitewave Foods to issue a new pasture rule. As we have in the past, we too encourage you to issue a pasture standard reflecting the NOSB recommendation and taking the added step of including a measurable requirement of 30% DMI into the pasture rule, not in the guidance as recommended by NOSB. We have found in our own farming community of more than 1000 organic dairy farmers that the NOSB recommendation, with the addition of the 30% DMI, is workable and enforceable. We have included CROPP Cooperative's internal standard that has been enforced through the cooperative as well as the FOOD Farmers' proposal which nicely restates the NOSB standard with the addition of the 30% DMI which reflects our recommendation as well.

We also hope that you can implement other recommendations of the NOSB, including the recommendation on cloning and origin of livestock. These are open issues in the organic standards that must be addressed. We know that these things do take time and resources, but with organic agriculture being a shining, growing star of agriculture, it is time and resources well spent.

Together, we thank you for your work on behalf of the organic foods movement. We would be happy to respond to any questions you may have.

Yours truly,

George L. Siemon
Chief Executive Officer
CROPP Cooperative/Organic Valley

Rich Ghilarducci
CEO/President
Humboldt Creamery Cooperative

Nancy Hirshberg
Vice President of Natural Resources
Stonyfield Farm, Inc.

CROPP COOPERATIVE PASTURE POLICY

Pasture Requirement

Organics is about integrity and commitment to sustainable farming. CROPP producers sign the CROPP membership agreement and are bound to abide by any additional standards approved by the CROPP Board. The CROPP Board and the Dairy Executive Committee have decided adequate pasture is a critical organic principle within organic livestock production. The following policy is a requirement for all CROPP dairy pool members. A Farm Pasture Plan must be on file for each member, demonstrating compliance with the Pasture Standards. Any members that do not satisfy the pasture standard will be enrolled in a Work Improvement Plan in order to come into compliance within one year.

Definition of Pasture

A pasture consists of a mixture of nutritious grasses, legumes and variable plant species, attached to their respective root systems. Pasture must be managed to prevent degradation
of soil and water quality.

CROPP Pasture Standards

1. A lactating cow must be provided 120 days on pasture per each growing season.
2. A minimum average of 30% dry matter intake of the total lactating cow's diet must come from grazed pasture during that region's grazing season.
3. The stocking rate for pasture is a maximum of three (3) lactating cows per acre of pasture. (If you can demonstrate a higher stocking rate is sustainable on your farm that will be acceptable.)
4. Dry cows must have a least 30 days access to pasture if that coincides with the grazing period for that region.
5. Young animals must have some introduction to pasture after six months of age. After one year of age, they must have access to pasture, coinciding with that region's grazing period.

Farm Pasture Plan Requirements

1. Ruminant livestock must have access to graze pasture during the months of the year when pasture provides edible forage, and the grazed feed must provide a **significant** portion of the feed requirements during those months but no less than a minimum average of 30% dry matter. The Farm Pasture Plan must illustrate how the producer will **optimize** the pasture component of the total feed used in the farm system. The Farm Pasture Plan must quantify how the CROPP Pasture Standards will be met.
2. The producer of ruminant livestock may be allowed temporary exemption to pasture because of:
   a. Conditions under which the health, safety, or well-being of the animal could be jeopardized.
   b. Inclement weather
   c. Temporary conditions which pose a risk to soil and water quality.
3. The producer of ruminant livestock may be allowed exemption to pasture during the following stages of production:
   a. Dairy stock under the age of 6 months
   b. Birthing

Resources:

NRCS (Natural Resources Conservation Service): offers guidelines specific to a producer's home locale. Cost-sharing may be available.

CROPP Pasture Mentor Program:

Producers will be available to serve as mentors to help those producers in need to guidance and expertise to expand their pasturing operations.

FEDERATION OF FOOD FARMERS
(from Letter to Mr. Knight, dated May, 2008)

Access to Pasture standards

1. *Organic dairy livestock over 6 months of age must graze on pasture during the months of the year when pasture can provide edible forage.*
2. *The grazed feed must provide significant intake for all milking-age organic dairy cows. At a minimum, an average of 30% of the dry matter intake each year must come from grazed pasture during the region's growing season, which will be no less than 120 days per year.*
3. *Temporary exemption from pasture may be allowed because of:*
    - i. *Conditions under which the health, safety, or well-being of the animal could be jeopardized, including to restore the health of an individual animal or to prevent the spread of disease from an infected animal to other animals.*
    - ii. *Short term inclement weather.*
    - iii. *Temporary conditions which pose a risk to soil and water quality.*
    - iv. *In no case will temporary confinement and exemption from this pasture standard be allowed as a continuous production system.*

The measurement of the consumption of dry matter from grazed pasture will be calculated based on the daily dry matter intake from grazing averaged over the total time period grazed per year.

Bobby L. Hall
Chief Executive Officer
June 24, 2008

Under Secretary Bruce Knight
Under Secretary for Marketing and Regulatory Programs
U.S. Department of Agriculture
1400 Independence Ave., S.W.
Washington, DC 20250

Dear Under Secretary Knight:

We are writing to express in our support for the immediate publication of well-defined access for organic pasture standards. We want to see the publication of a rule that clearly states the following as a minimum for compliance:

Access to Pasture Standards

1. ***Organic dairy livestock over 6 months of age must graze on pasture during the months of the year when pasture can provide edible forage.***

2. ***The grazed feed must provide significant intake for all milking-age organic dairy cows. At a minimum, an average of 30% of the dry matter intake each year must come from grazed pasture during the region's growing season, which will be no less than 120 days per year.***

3. ***Temporary exemption from pasture may be allowed because of:***

    - ***Conditions under which the health, safety, or well-being of the animal could be jeopardized, including to restore the health of an individual animal or to prevent the spread of disease from an infected animal to other animals.***
    - ***Short-term inclement weather.***
    - ***Temporary conditions, which pose a risk to soil and water quality.***
    - ***In no case will temporary confinement and exemption from this pasture standard be allowed as a continuous production system.***

The measurement of the consumption of dry matter from grazed pasture will be calculated based on the daily dry matter intake from grazing, averaged over the total time period grazed per year.

Our Cooperative supports these standards for all certified organic dairy farms. We join with others in the organic industry to publicly ask that you use all the influence of your department to speed the publication and rapid implementation of the clarification of the access to pasture rule.

Sincerely,

Bobby L. Hall
Chief Executive Officer

Daniel Wolf
President

HP Hood LLC Six Kimball Lane Lynnfield, MA 01940 (617) 887-3000

May 29, 2008

Under Secretary Bruce Knight
Under Secretary for Marketing and Regulatory Programs
U.S. Department of Agriculture
1400 Independence Ave., S.W.
Washington, DC 20250

Dear Under Secretary Knight:
I write to you on behalf of HP Hood LLC and our more than 300 organic dairy farmers in support of the publication of a well-defined access-to-pasture standard under the USDA Organic certification program. As a manufacturer of organic milk products, we urge you to quickly issue and enforce a pasture standard to reflect the NOSB recommendations.

In addition to obtaining and maintaining organic certification through a USDA accredited certification organization, Hood and other leaders in the industry have already adopted pasture standards and we urge your administration to require that dairy animals over the age of 18 months be required to have a minimum of 120 days access to pasture during the growing season; that 30% of the total ration's dry matter intake of lactating dairy animals be provided by grazing; and that dairy animals six months and older be required to have access to pasture in accordance with the region's growing season.

HP Hood and other dairy manufacturers have responded to consumer requests for choice in the dairy aisle, including USDA Certified Organic milk and dairy products. Consumer trust and confidence remains a priority for the industry as consumers of organic dairy products must be assured that the products they consume are regulated under the most stringent guidelines of the program. Formalizing and enforcing an access-to-pasture standard will only help strengthen and preserve the integrity of the USDA Certified Organic program and its products.

Once again we urge you to expedite the publication and implementation of clearly defined access-to-pasture standards.

Thank you for your consideration.

Sincerely,
Mike Suever
Senior Vice President, R&D, Engineering and Milk Procurement
HP Hood LLC

Organic Dairy Farmers Cooperative, Inc.
12 NORTH PARK STREET
SENECA FALLS, NEW YORK 13148

May 21, 2008

Under Secretary Bruce Knight
Under Secretary for Marketing and Regulatory Programs
U.S. Department of Agriculture
1400 Independence Ave., S.W.
Washington, DC 20250

Dear Mr. Knight:

I am writing to express in the strongest terms our Cooperative's support for the immediate publication of strict and well defined access to pasture standards. We want to see the publication of a rule that clearly states the following as a minimum for compliance:

Access to Pasture standards

1. *Organic dairy livestock over 6 months of age must graze on pasture during the months of the year when pasture can provide edible forage.*
2. *The grazed feed must provide significant intake for all milking-age organic dairy cows. At a minimum, an average of 30% of the dry matter intake each year must come from grazed pasture during the region's growing season, which will be no less than 120 days per year.*
3. *Temporary exemption from pasture may be allowed because of:*
    i. *Conditions under which the health, safety, or well-being of the animal could be jeopardized, including to restore the health of an individual animal or to prevent the spread of disease from an infected animal to other animals.*
    ii. *Short term inclement weather.*
    iii. *Temporary conditions which pose a risk to soil and water quality.*
    iv. *In no case will temporary confinement and exemption from this pasture standard be allowed as a continuous production system.*

The measurement of the consumption of dry matter from grazed pasture will be calculated based on the daily dry matter intake from grazing averaged over the total time period grazed per year.

Our cooperative members support the strictest interpretation of these standards by all organically certified organic dairies. The meeting you recently had with representatives from the National Organic Coalition, the Federation of Organic Dairy Farmers, and WhiteWave Foods showed their support and the support of the whole organic community for the publication and implementation of strict standards.

We join with others in the organic industry to publicly ask that you use all the influence of your department to speed the publication and rapid implementation of the clarification of the access to pasture rule.

Sincerely,

Daniel France

President, Organic Dairy Farmers Cooperative

cc: J. Burton Eller, Jr., Barbara Robinson, Richard Mathews, Ed Maltby, Sharad Mathur, Mimma Kisor

Under Secretary Bruce Knight
Under Secretary for Marketing and Regulatory Programs
U.S. Department of Agriculture
1400 Independence Ave., S.W.
Washington, DC 20250

Dear Under Secretary Knight
I am writing to express in the strongest terms Organic Choice Milk Procurement's support for the immediate publication of strict and well defined access to pasture standards.
We want to see the publication of a rule that clearly states the following as a minimum for compliance:

Access to Pasture standards

1. *Organic dairy livestock over 6 months of age must graze on pasture during the months of the year when pasture can provide edible forage.*
2. *The grazed feed must provide significant intake for all milking-age organic dairy cows. At a minimum, an average of 30% of the dry matter intake each year must come from grazed pasture during the region's growing season, which will be no less than 120 days per year.*
3. *Temporary exemption from pasture may be allowed because of:*
    - i. *Conditions under which the health, safety, or well-being of the animal could be jeopardized, including to restore the health of an individual animal or to prevent the spread of disease from an infected animal to other animals.*
    - ii. *Short term inclement weather.*
    - iii. *Temporary conditions which pose a risk to soil and water quality.*
    - iv. *In no case will temporary confinement and exemption from this pasture standard be allowed as a continuous production system.*

The measurement of the consumption of dry matter from grazed pasture will be calculated based on the daily dry matter intake from grazing averaged over the total time period grazed per year.

Our company and our producers across the country support the strictest interpretation of these standards by all organically certified organic dairies. The meeting you had with representatives from the National Organic Coalition, Federation of Organic Dairy Farmers, and WhiteWave Foods showed their support and the support of the whole organic community for the publication and implementation of strict standards. We join with others in the organic industry to publically ask that you use all the influence of your department to speed the publication and rapid implementation of the clarification of the access to pasture rule.

Sincerely

Steven Pechacek
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PASTURELAND

May 27, 2008

Under Secretary Bruce Knight
Under Secretary for Marketing and Regulatory Programs
U.S. Department of Agriculture
1400 Independence Ave., S.W.
Washington, DC 20250

Dear Under Secretary Knight,
I am writing to express in the strongest terms PastureLand Cooperative support for the immediate publication of strict and well-defined access to pasture standards.
We want to see the publication of a rule that clearly states the following as a minimum for compliance:

Access to Pasture standards

1. *Organic dairy livestock over 6 months of age must graze on pasture during the months of the year when pasture can provide edible forage.*
2. *The grazed feed must provide significant intake for all milking-age organic dairy cows. At a minimum, an average of 30% of the dry matter intake each year must come from grazed pasture during the region's growing season, which will be no less than 120 days per year.*
3. *Temporary exemption from pasture may be allowed because of:*
    i. *Conditions under which the health, safety, or well-being of the animal could be jeopardized, including to restore the health of an individual animal or to prevent the spread of disease from an infected animal to other animals.*
    ii. *Short term inclement weather.*
    iii. *Temporary conditions which pose a risk to soil and water quality.*
    iv. *In no case will temporary confinement and exemption from this pasture standard be allowed as a continuous production system.*

The measurement of the consumption of dry matter from grazed pasture will be calculated based on the daily dry matter intake from grazing averaged over the total time period grazed per year.

Our co-operative and our member-owners support the strictest interpretation of these standards by all organically certified organic dairies. The meeting you had with representatives from the National Organic Coalition, Federation of Organic Dairy Farmers, and WhiteWave Foods showed their support and the support of the whole organic community for the publication and implementation of strict standards. We join with others in the organic industry to publically ask that you use all the influence of your department to speed the publication and rapid implementation of the clarification of the access to pasture rule.

Sincerely

Jean Andreasen
General Manager, PastureLand Cooperative

cc J. Burton Eller, Jr. ,(Deputy Under Secretary for Marketing and Regulatory Programs);
Barbara Robinson (NOP Deputy Administrator for Transportation & Marketing Programs)
Richard Mathews, (NOP Standards Development & Review)
Ed Maltby, (NODPA Executive Director, Email: ednodpa@comcast.net ; Fax 866-554-9483)

Attachment B: "Extending the grazing season" by John Cockerall of the University of Wisconsin

TECHNIQUES FOR EXTENDING THE GRAZING SEASON

Prepared by
John R. Cockrell
UW-Extension Grazing Specialist

Most livestock producers are aware that pasture harvested by the cow is cheaper than forage which is harvested, stored and then removed from storage and fed to the cow. Some studies show that pastured forage costs about 1 to 1½ cents per pound of dry matter (DM) in the cow with most of the manure applied back on the pasture. Stored forage costs about 4 to 5 cents per pound of DM plus the cost of storage, feeding and manure hauling. Unfortunately, most livestock producers in the Upper Midwest don't understand the principles of good pasture management. Therefore, they are only able to utilize cheap pasture forage for a few months each year. Let's look at some of the methods we can use to extend the grazing season.

In Southern Wisconsin, our typical pasture growing season consists of 5 months of rapid growth (May, June, July, August and September), 2 months of slow growth (April and October) and 5 months of no growth (November, December, January, February and March). We must understand that pasture growth rates can be greatly influenced by rainfall and temperature from year to year just like they are in New Zealand, Ireland and Australia. However, there are cow calf producers in Southwestern Wisconsin who regularly graze their cows 12 months out of the year. With a little cooperation from the weather, they will get most of the cows' feed from pasture 7-8 months of the year and they get some of the cows' feed requirements from pasture 4-5 months of the year. While rainfall, temperature and snow depth can greatly influence pasture productivity and/or availability, experienced graziers soon develop management techniques to reduce the impact on their livestock.

Some management practices used by experienced graziers to lengthen the grazing season are as follows:

I. Fertilization

Proper fertilization is essential for maximum pasture productivity. Well fertilized pastures will not only grow more DM per acre, but will also be higher in protein and energy and will be more palatable, which will improve DM intake. The end result is improved livestock performance.

While adequate fertilization will improve pasture productivity and utilization, over- fertilization is a waste of money and a very poor environmental practice. To determine pasture fertilizer needs, run plant tissue analysis every few years. Tissue analysis is superior to soil testing, because it tells you what is in the plant which is all that matters. Also, tissue sampling is the most accurate method to evaluate the availability of trace elements. Apply corrective fertilizer according to test recommendations. If you are not familiar with taking plant tissue samples, contact your local Extension Office for assistance.

-

I would recommend the application of 40 to 50 units of nitrogen fertilizer starting in early June and continuing after each grazing or mechanical harvest. Also, I would time the last application for about the middle of October. This will build a strong root system and promote early growth next spring.

The biggest mistake many farmers make is to delay nitrogen application until deficiency symptoms show up (i.e. yellow grass). We then must get the nitrogen on the pasture, wait for rain, wait for the nitrogen to enter the plant through the roots and then wait for the plant to grow. This practice just wasted 4 to 6 weeks out of an already short growing season. High quality pasture is the cheapest feed source for your cows. Saving a few dollars on fertilizer could be very costly.

Also, you will find that well fertilized pastures are much more drought tolerant than low fertility pastures, therefore, extending the grazing season.

II. Subdividing Pastures

Proper pasture layout is essential for easy pasture management. I would suggest rather large paddocks which are zone fenced. For example, keep everything the same if possible, like south slopes fenced separately, fence north slopes separately, separate bottoms from sloping hillsides and ridge tops, etc. Large paddocks can be further subdivided with an electrical tape when necessary.

When pastures are ready to graze, the cattle should be given an area they can harvest in 12 hours to 3 days, depending on type of livestock and production goals. For example, many dairy graziers will move fresh cows to new grass after every milking, stockers may be moved in 1 to 2 days, and cow-calf graziers may give larger breaks for 3 days. Regardless of length of occupation, paddocks must be properly sized so that cows will clean up most of the available forage. This practice will assure vegetative regrowth and high quality forage availability in the next round. Pasture forage that is not grazed in previous rounds probably will not be grazed at all, and even if it is grazed, it will be low quality forage. After 5 days, grazed plants will begin to put out new shoots. If cattle are allowed to graze regrowth, this will result in less and less forage available as the grazing season progresses. One experienced grazier said, "You might just as well put herbicide on your pastures as to graze them for long durations." This is the primary reason continuous grazed pastures are usually done by early to mid July.

III. Rest Periods

Properly subdivided and fertilized pastures allow for rapid growth and quick harvest. A proper rest period allows the root system to grow and recover from the previous grazing. Studies have shown that severe defoliation greatly reduces the plant's root system. When severe defoliation is followed by a dry period, the results will be a forage deficit. On the

other hand, when no more than 50% to 60% of the plant is defoliated, there is little reduction in the size of the root system. Therefore, a good rule of thumb is to graze half and leave half. However, if we turn cattle in on 6 inch tall pastures, we would probably want to graze 4 inches and leave 2 inches since there is more DM in the bottom half than the top half of the plant.

Another good rule of thumb to follow is when pasture growth is slow, slow down the rotation. In other words, lengthen the rest period. To do this may require that you feed supplemental feed. But when pasture growth is rapid, you should speed up the rotation or have shorter rest periods. This sounds simple, but most new graziers do just the opposite for some reason.

IV. Stockpiling

In Ireland they call it building a feed wedge, in New Zealand it is called autumn saved pasture, and in the Upper Midwest we use the term stockpiled pasture. No matter what the practice is called, it is the nuts and bolts of pasture management which allows us to extend the grazing season into periods of slow and no pasture growth.

(a) Summer Stockpiling

First of all, it usually pays to carry some surplus pasture into our potentially hot and dry July-August period. This can be accomplished by keeping a fair amount of fresh grown pasture ahead of you and slowing down the rotation. If daily growth rates drop below daily cattle demand, use supplemental feed early on so you can keep grazing through the dry period. If the rains continue, the surplus will need to be harvested to keep pastures in a vegetative growth stage.

(b) Fall And Winter Stockpiling

Beginning around August 15th, we should divide the farm into thirds to accumulate surplus stockpiled pasture for late fall and winter grazing. The first 1/3 of the pastures will be grazed hard from late August through September and October. Pastures will need to be fertilized ahead of this period to ensure adequate growth as discussed earlier. During dry falls and until pastures become well established, you may need to feed supplemental forage and/or grain. The remaining 2/3 of the farm will be allowed to grow from late August through the end of October. We will then take 1/3 of the farm which contains the stockpiled forage and graze it during late fall and early winter. This will be very high quality pasture. Pasture grown in the fall doesn't lose quality like it would in the spring. You will find that dry cows will fatten very rapidly on this forage. You will need to use electric tapes to ration out the feed supply to prevent cows from becoming overly fat and trampling the remaining pasture. Do Not feed grain except in cases of severe pasture shortages to non lactating cattle.

The remaining 1/3 of the stockpiled pasture will be reserved for mid to late winter feeding. To make this practice effective, you will need to know your farm. For example, learn where the slopes and ridges are that accumulate the least amount of snow. Save these areas for mid to late winter grazing. While you will need to feed supplemental feed during this period, you can greatly reduce labor requirements by feeding as much pasture as possible. Many graziers will leave wrapped bales in these areas for winter supplementation, therefore reducing the need to move feed in the winter.

Benefits Of Stockpiling

There are 2 primary benefits from stockpiling practices described above.

1. We are able to greatly reduce the use of stored feed during the late fall and winter. This practice not only saves money, but labor as well.
2. We stagger the spring green up so that pasture management becomes a little easier. The first new growth to appear will be in the 1/3 of the farm that was grazed in late winter and early spring. Don't forget the fall fertilization practices mentioned earlier if you want early spring grazing. We probably get early green up in this area first, because the roots were able to collect stored carbohydrates all fall and were insulated by the top growth during the winter. When this top growth is removed in late winter or early spring, the plant is ready to grow.

The second area to green up a few weeks later will be the 1/3 that was grazed in the late fall and early winter. I suspect this occurs because the root has lots of stored carbohydrates, but lacked insulation from the top growth all winter.

The last area to green up will be the 1/3 of the farm that was grazed hard during late summer and early fall. These roots were not allowed to store carbohydrates and had no insulation. This is primarily why people who over graze their farm all fall rarely have enough pasture to fully feed their cows before mid May to early June. If this is followed by a hot, dry period in July or August, we can see that these farmers will have a very short grazing season. They will probably tell the world that grazing doesn't work in the Upper Midwest. Actually, in their case, they are absolutely correct.

V. Other Practices

Some graziers will plant a few acres of corn to be left standing in the field all winter. The corn will stand up through the snow and can be utilized during periods of heavy snowfall. This is a very low cost, low labor feeding system. With a little thought, I am sure you can develop other low cost, low labor feeding systems that will work on your farm. Remember, grazed forage costs 1½ cents per pound of DM and is very low labor while stored feed will cost 4-5 cents per pound of DM and has very high labor requirements. Therefore, thinking and planning can be very profitable.

VI. Caution

While many of the practices described above sound fairly simple, it takes experience and practice to implement them successfully. As we all know, there can be some very brutal winters in the Upper Midwest from time to time and you will always need to have a backup plan in place. This could mean buying feed or wintering cows off the farm, but you definitely must have a plan.

VII. In Conclusion

Feeding stored feed to cattle is very costly and labor intense. However, the system is fairly well understood and for most farmers is a no-brainer. On the other hand, grazing can be very low cost and low labor, but it is very management intense. Much of the time you used to spend doing manual tasks will be spent thinking. You will save money and/or increase profits only if you make the correct decisions and implement the practices successfully into your management. To be a successful grazier, you must enjoy the challenge. If you don't enjoy the challenge of grazing, your chances for success will be very slim.

To increase your chances for success I would suggest graziers with similar goals and interests (i.e. cow-calf, stocker, or dairy graziers) form discussion groups and share information. Remember as graziers you are the primary source of new information available today. There are very few agribusinesses that are willing to spend time and/or money to show you how to reduce cost. I learned the information presented in this paper from farmers and hope that you can use it to improve the profitability of your grazing business.

Attachment C: "Does Pasture Finished Beef make the Grade" is a 2008 study by University of Wisconsin

Does pasture-finished beef make the grade?

Center for Integrated Agricultural Systems • UW-Madison College of Agricultural and Life Sciences • Sept. 2008

Research Brief #77

Finishing beef animals on pasture can potentially reduce the overhead costs of facilities and equipment compared to confinement finishing. Researchers at UW-Madison set out to learn if beef animals finished on pasture can make the Select and Choice quality grades for conventional meat markets.

The researchers—Jeff Lehmkuhler from Animal Sciences and Dan Undersander from Agronomy—investigated the performance of steers on pasture with and without supplements. The researchers compared crossbred beef steers typical of Wisconsin beef farms to crossbred Normande steers. The Normande breed is a dual purpose milk/meat breed which is growing in popularity. The purpose of this comparison was to determine if Normande-cross steers are a viable option for farmers finishing beef animals. From 2005 to 2007, the researchers collected data at the UW-Madison Lancaster Agricultural Research Station. Support was provided by a USDA-CSREES HATCH grant.

The researchers compared a diet based exclusively on pasture with three supplementation strategies. A diet of pasture plus alfalfa pellets was one strategy, chosen because alfalfa pellets can provide forage-based protein and dry matter for grazing cattle when pasture availability is low. The other two pasture supplements included soyhulls and dried distillers grains. One of these two treatments included an ionophore (an antibiotic added to cattle feed to prevent disease and promote efficiency), which allowed for the comparison of natural and conventional production systems. Dried distillers grains were of interest because of their growing availability, high levels of undegradable protein and unsaturated fatty acid content. Soyhulls were included due to high fiber digestibility. Steers were offered up to 9 pounds of supplement per head daily, which provided an estimated 50 percent of each animal's daily dry matter intake over the grazing season.

Forty-eight steers were grazed each season. These animals were divided equally across the four supplementation treatments (12 steers per treatment). The use of electronic gates fastened to feed bunks allowed for all treatments to be offered in the same pasture area, reducing the impact of pasture type and quality on the responses from the supplementation strategies. The pastures were predominately a cool-season grass legume mixture. Steers were moved to new areas of pasture three times weekly.

Of the 12 steers assigned to each treatment, half were of Normande influence and the remaining were crossbred beef steers of British genetics, predominately Angus and Hereford sired. Regardless of genetics, the target beef quality grade was Select or higher. From an economic standpoint, it is important to produce carcasses with sufficient marbling to attain at least a Select grade.

Alfalfa supplement intake varied considerably between animals. A few steers consumed nearly all 9 pounds offered while others ate only a couple of pounds. There was less variability in the intake of both grain co-product supplements. During the grazing season, steers receiving alfalfa pellets consumed approximately two-thirds the amount of supplement by weight as those receiving the grain co-product.

Supplementation and rate of gain

"Supplementation, regardless of type, increased daily gains for steers in all three years" says Lehmkuhler. (See Fig. 1 on page 2.) Alfalfa pellets increased daily gains by approximately 0.25 lb/day in comparison to the pasture only treatment. Co-product supplementation increased daily gains even more. The inclusion of an ionophore significantly increased gain in only one of the three years. This lack of consistent gain response was observed in previous supplementation research at the station with a different ionophore.

Carcass characteristics

The increased performance of supplemented animals did impact carcass characteristics. Use of grain co-products produced heavier carcass weights and

Electronic gates allowed steers in all treatments to graze together and have access to the supplement assigned to them.

higher dressing percentages. Ribeye area, an indicator of overall carcass muscle mass, was larger for cattle receiving alfalfa and co-product supplements, primarily due to the heavier carcass weights.

Animals were harvested directly off pasture in 2005 and 2007. In 2006, the researchers checked the steers with ultrasound as they approached targeted weight and backfat endpoints. Most of the grain co-product steers met the targets and were harvested directly off pasture. The steers on the pasture-only and alfalfa pellet treatments needed additional time to attain the Select grade weight and marbling. Animals not meeting the targets were placed in a confinement barn and offered alfalfa haylage along with the supplements assigned to their group until they were harvested approximately 60 days later. At that point, carcass differences between treatments were minimal.

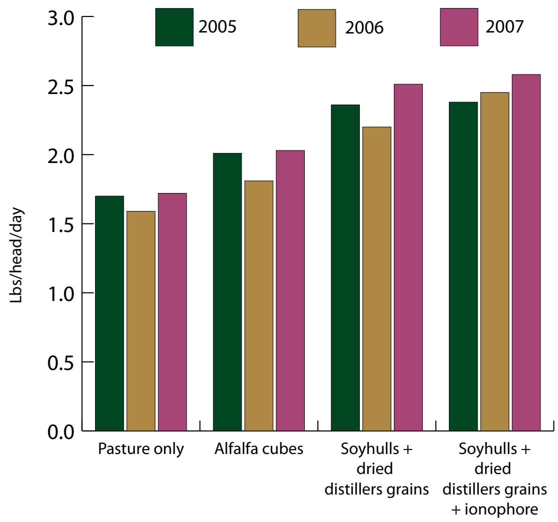
Warner-Bratzler shear force values, which indicate meat tenderness, were not found to be different among treatments. In addition, meat tenderness of these pasture-based steers was similar to that of ten other steers fed under conventional feedlot management practices and receiving the same amount of co-product supplement in 2005. This would further support the potential for producing acceptable beef with a grass or forage-based finishing system. Steers grazing pasture without any supplement produced beef that was of similar marbling as supplemented cattle. Only in 2007 was the average marbling score greater for the supplementation treatments compared with those from steers consuming just grass.

A dry growing season in 2005 resulted in the necessity to remove animals from pasture in early October. Subsequently, cattle did not have the degree of finish desired and this was reflected by the low percentage of cattle achieving the target quality grade. However, in 2006 and 2007 more than 70 percent of the carcasses from the supplementation treatments graded USDA Select, Choice or Prime.

Normande cross steers gain well

The Normande-influenced steers performed similarly to the crossbred beef steers. The Normande steers were on average a month younger, and therefore lighter, than the beef breed steers due to different calving seasons on the source farms in 2006 and 2007. Over all three years, the Normande carcasses had higher dressing percentages and less backfat than the beef breeds, as expected. While ribeye area was not different among the breed types, the conventional crossbred beef carcasses had higher marbling scores than the Normande. This was unexpected and may partially result from the lighter weight and younger age of the Normande cattle at slaughter. Normande cattle responded similarly to the beef crossbred steers to the different supplementation strategies.

Average daily gain of steers consuming different supplements in a pasture finishing system



The bottom line

Through the use of supplementation, it is possible to produce beef on pasture that will meet commodity market specifications. More time is required to meet these specifications when diets are strictly forage based. The cost of the additional dwell time for the forage-based steers is a trade-off with respect to the added cost of supplementation. But supplementation is a way to stretch pasture, especially during a summer slump in pasture growth. With growing consumer interest in grass-fed and -finished beef, some farmers may prefer not to supplement their cattle and sell their beef directly to customers or specialty markets rather than commodity markets. Dual-purpose Normande-influenced steers had daily gains similar to more conventional crossbred beef steers when managed in a pasture finishing system. These findings can help beef producers make better informed decisions related to alternative production systems.

For more information, contact:

Dan Undersander, UW-Madison Agronomy Department, 608-263-5070, djunders@wisc.edu

The Center for Integrated Agricultural Systems (CIAS) brings together university faculty, farmers, policy makers, and others to study relationships between farming practices, farm profitability, the environment, and rural vitality. Located in the College of Agricultural and Life Sciences at the UW-Madison, it fosters multidisciplinary inquiry and supports a range of research, curriculum development, and program development projects. For more information on the Center or on the research in this Brief, contact: **CIAS, 1535 Observatory Drive, UW-Madison, Madison, WI 53706 Phone: (608) 262-5200 Fax: (608) 265-3020 E-mail: ramcnair@wisc.edu, www.cias.wisc.edu**

This Research Brief is part of a series. Contact CIAS for other titles. CIAS staff members are grateful for the reviews of this research update by UW-Madison and UW-Extension faculty and CIAS Citizens Advisory Council members. Printed on recycled paper. September, 2008.

Attachment D: "Sward Characteristics of Beef Finishing Pasture" a 1996 presentation by Jim Gerrish, F. Martz and V. G. Tate

This paper was published in the Proceedings 1996 AFGC Annual Conference Vancouver BC, June 12-16, 1996.

SWARD CHARACTERISTICS OF BEEF FINISHING PASTURES

J.R. Gerrish, F.A. Martz, V.G. Tate[1]

Abstract

For cattle to successfully finish on pasture, abundant high-quality forage must be available to the grazing animals. Eighty-eight steers were finished on pasture with grain supplementation ranging from 0 to 75 % of the dietary energy supplied by grain. Pastures were intensively managed, cool-season, grass-legume pastures. Forage dry matter availability increased throughout the grazing season. The quality of the pastures also improved through the season, with crude protein (CP) content increasing and acid detergent fiber (ADF) content decreasing. Forage intake decreased at an average rate of 1 lb for each lb of grain fed. Observed average daily gains (ADG) were consistent with predicted ADG based on forage plus grain intake levels.

Introduction: To successfully finish cattle on pasture, forage quality must be high and forage availability maintained at adequate levels to ensure optimal intake. Blaser et al. (1977) suggest that energy intake will limit performance of ruminants grazing cool-season forages before protein or other nutrients. Energy content of perennial cool-season forages is most affected by maturity of the plant. Management of high energy potential pastures must focus on maintaining plants in a high quality, vegetative state. In this research we examined trends in forage availability, pasture quality, and voluntary forage intake.

Materials and Methods: A pasture-based, beef finishing project was conducted at the University of Missouri - Forage Systems Research Center in north-central Missouri in 1995. Eighty-eight steers were assigned to four grain feeding levels on pasture with each treatment replicated twice. Grain feeding levels were expressed as the percent of their total dietary energy intake supplied by grain and were 0, 25, 50 and 75 % with the remaining nutrients supplied by pasture. The pasture with steers receiving no grain was stocked at 1.0 steer to the acre. The pasture with steers receiving 25 % of their energy from grain was stocked at 1.25 steers per acre. The pasture with steers receiving 50 % of their energy from grain was stocked at 1.5 steers per acre. The pasture with steers receiving 75 % of their energy from grain was stocked at 1.75 steers per acre (Table 1).

During the first phase of the experiment, April 22 to August 22, the supplement was cracked corn. During the second phase, August 23 to October 30, the supplement contained 70 % cracked corn and 30 % corn gluten feed.

Each treatment consisted of 8 acres which were divided into six permanent paddocks (Fig 1). During the grazing season, these were further divided with temporary fences and animals were allowed to back graze the paddock in order to access the water supply. Each subdivision within a paddock provided the animals with 1 to 3 days of feed depending on the season. Rest periods ranged from 10 to 35 days depending upon season and subdivision within paddock. Pastures were clipped for seedhead control in early June after cool-season grasses had headed.

Table 1. Supplementation level, stocking rate, and number of steers per treatment group in pasture-based finishing study.

Supplementation level	Stocking rate	Number of steers
% of diet	steers/acre	no.
0	1.00	8
25	1.25	10
50	1.50	12
75	1.75	14

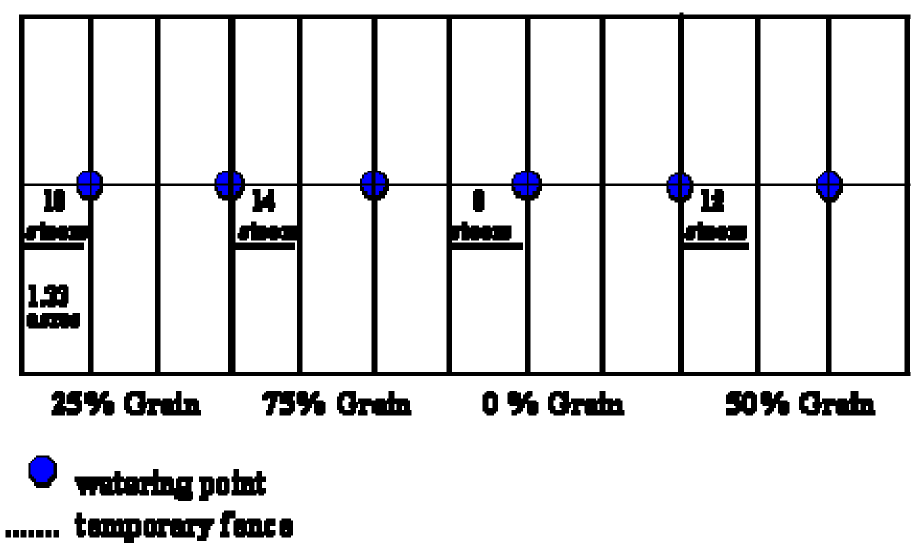


Figure 1. Schematic outline of one replication of beef-finishing pastures.

Within each treatment, individual paddocks were gridded into 900 ft2 blocks for pasture sampling purposed. Prior to the allocation of a new grazing strip, one 2.7 ft2 quadrat was cut from each grid block in that pasture allocation strip. Samples were oven dried and CP, ADF, and neutral detergent fiber (NDF) were determined using near infra-red reflectance spectroscopy. Forage samples were collected from May 16 to October 18, 1995. Species composition data were collected from these paddocks as well. Forage dry matter intake (DMI) was calculated by the difference method using quadrats clipped prior to and immediately following grazing of an individual paddock.

Results and Discussion: Forage quality of these cool-season grass-legume pastures increased during the season, with CP increasing and ADF decreasing. Crude protein was not limiting for the animals at any time during the grazing season. Crude protein requirement for medium-framed 700-pound steers gaining 2.0 lb/day is approximately 10%, according to the National Research Council (1984). Crude protein levels of the forage exceeded this requirement throughout the season (Fig. 2). This result is in concurrence with the claims of Blaser et al. (1977) that protein would not limit performance on cool-season pastures. Linear regression was used to determine trend in forage quality through the season using day of year as the independent variable. For CP the relationship of CP to day of year was significant (P=.05) for the 0%- and the 75%- grain groups and a strong trend held true for the 25% and 50% groups (P<.10). For ADF the relationship to day of year was also significant (P=.05) for the 0%- and 75%- grain levels, and again the strong trend held true for the 25% and 50% groups. Cool-season pastures are often cited as being low quality during the summer months. Results of this research indicate that cool-season pastures managed to maintain vegetative forage are quite high quality even through the summer months.

Forage dry matter availability also increased during the season. Accurate forage sampling was hampered in the early part of the season due to extremely wet weather so forage availability data is presented for only Phase II. Forage intake by grazing animals during the Phase I period also appeared to be depressed due to heat stress and excessive rainfall. Rainfall during the Phase I period was 18 in. above normal for the research location. Phase II forage availability at turn-in and daily forage intake are in Table 1. The observed intake indicates that the steers in the 0 grain treatment were consuming adequate forage dry matter to maintain the expected ADG of 2.0 pounds per day.

A concern about feeding high levels of grain on pasture is the substitution of grain intake for forage intake. Based on the intake data in Table 2, it appears that the first increment of grain fed has the greatest negative impact on forage intake. The substitution coefficients for 25-, 50-, and 75%-grain feeding levels were 1.26, 1.00, and .74, respectively. Steer performance in this study as reported by Martz et al. (1996) indicates very little difference in ADG between the 0- and 25%-grain groups. The lack of response to grain supplementation at the 25% level may be the result of decreased forage intake in the presence of added grain in a quantity that was high enough to affect rumen performance but not high enough to increase ADG. Average forage availability was very similar between the 0- and 25%-grain supplemented pastures, suggesting that forage availability was probably not limiting intake. Mean forage availability in the 50- and 75%- grain supplemented pastures was significantly lower than the 0 and 25% grain pastures. As the steers receiving higher levels of supplementation increased body weight, their forage consumption in terms of pounds of dry matter per head likely increased more rapidly than the steers growing at a slower rate. More forage was, therefore, consumed in each grazing cycle and the residual following grazing was reduced. The lower residual dry matter resulted in slower regrowth and lower dry matter yield at turn-in on each subsequent grazing cycle. The availability was low enough that forage intake may have been limited on these pastures explaining why steer performance on the 75%-grain pastures was not as high as what would have been predicted.

In summary, forage quality tended to increase throughout the grazing season on all treatments. Forage availability at the beginning of each rotation remained near constant or slightly increased for the 0- and 25%-grain groups while availability tended to decrease slightly through the season for the steers receiving 50 and 75% grain levels. It appears that forage availability was more likely to limit steer performance than would forage quality on these mixed cool- season grass-legume pastures.

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Table 2. Forage dry matter availability and voluntary dry matter intake of steers grazing pasture at four levels of grain supplementation.

Grain supplementation level	Available dry matter at turn-in	Voluntary forage intake
% of diet	-- lb/A --	- lb/hd/day -
0	2659	21.5
25	2583	12.7
50	1983	9.6
75	2161	8.2

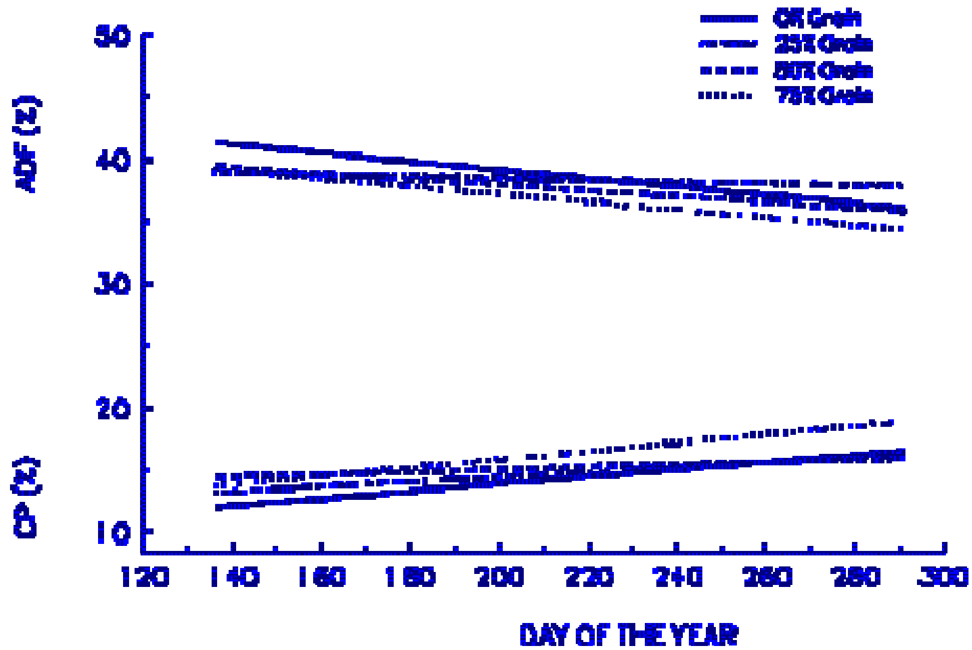

Figure 2. Trend in forage acid detergent fiber (ADF) and crude protein (CP) in cool-season, grass-legume pastures across the grazing season.

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[1]Research Assistant Professor, Research Professor of Animal Sciences and Superintendent, and Research Associate, respectively; University of Missouri-Forage Systems Research Center (FSRC), Route 1 Box 80, Linneus, MO 64653

Attachment E: FOOD Farmers report on measuring Dry matter

Report from the ad hoc committee to clarify the measurement of pasture consumption

NODPA convened a committee to compile practical ideas on measuring dry matter intake that could be applied consistently across the country.
The committee was chaired by the newly appointed head of Organic Dairy Development & Research at the University of New Hampshire Organic Research Farm, Kevin Brussell and included Kathy Soder (USDA ARS), Kathie Arnold (NODPA Board member), Arden Nelson (WODPA Board member), Lisa McCrory (NOFA VT), Jim Gardiner (NODPA Board member), Juan Velez (Aurora Organic Dairy) and Ed Maltby, NODPA Executive Director.
August 13, 2007

Report Title: Thought for the day: Eat more pasture- do less work

Access to Pasture standards

1. Organic dairy livestock over 6 months of age must graze on pasture during the months of the year when pasture can provide edible forage.
2. The grazed feed must provide significant intake for all milking-age organic dairy cows. At a minimum, an average of 30% of the dry matter intake each year must come from grazed pasture during the region's growing season, which will be no less than 120 days per year.
3. Temporary exemption from pasture may be allowed because of:
    a. Conditions under which the health, safety, or well-being of the animal could be jeopardized, including to restore the health of an individual animal or to prevent the spread of disease from an infected animal to other animals.
    b. Short term inclement weather.
    c. Temporary conditions which pose a risk to soil and water quality.
    d. In no case will temporary confinement and exemption from this pasture standard be allowed as a continuous production system.

The consensus of the group was that the estimation of the consumption of dry matter from grazed pasture will be made looking at the average dry matter intake from grazing for the lactating herd each year.
The following is to try to answer some of the questions and concerns that have been raised, providing guidance for the certifier and producer in how they might measure the consumption of dry matter from grazing.

1. Will a producer get de-certified with one year at 25% DM consumption?
    a. The measurements can not be that precise and are an accumulation of many different calculations including: pasture logs; daily record of TMR provided; tracking refused TMR; weather; time of calving.
    b. Every farm is different and precipitation may vary greatly over short distances
    c. The whole farm plan should be geared to a goal of easily meeting the 30% minimum with sufficient margin for usual weather variances;
    d. As with other situations within the organic certification, the inspector will be looking at many different aspects of production and management to assess the reasonableness of the farm achieving an average minimum of 30% which will determine the level of warning and censure for a one year below an average minimum of 30%.

2. Would there be any situation where an irrigated pasture in an arid climate be allowed an exemption based on "inclement weather"?
    a. The source of the irrigation (snow or catchment area) can be subject to weather changes:
        1. For ditch irrigation there is third party data available to show yearly variance in availability.

        2. For center pivot or other irrigation there may be limited third party information but good management would record water usage.
    b. Climatic data for different regions is easily available over the internet and regional information can be used to assess if weather conditions were a factor in poor quality pasture.
    c. It takes longer to establish a productive, balanced pasture in arid areas which make the establishment more susceptible to weather changes. This extended timeline would need to be included within the whole farm plan and realistically appraised with the initial certification. In order to meet the requirement, cow numbers will likely need to be initially adjusted downward from final planned herd size if a new operation does not have already established pasture.

3. What is the role of management?
    a. A realistic appraisal of the number of cows the pasture can support.
    b. Layout of farm to maximize access to pasture.
    c. Seeding of annual forage crops as a balance for extremes of weather or as a permanent rotation to recognize repeated weather patterns.
    d. Good record keeping to build an accurate picture of the productivity of the pasture to be able to do forward budgeting and to adjust cow numbers, calving pattern or other controllable areas.

4. Is there enough understanding of calculating dry matter and testing of feed by producers?
    a. It is only critical when the producer starts to be within 10% of the average minimum of 30% over a year’s grazing season(s), probably most that do it on an “as-fed” base would be above this level.
    b. A work sheet has been developed that will assist producers in calculating and recording the feed consumed by their dairy herd.
    c. Information is attached on how to calculate dry matter and other factors affecting consumption of feed.
    d. The certifier would have cause to require testing of feed for volume (i.e. weight of bales) and dry matter from any producer who came close to the 30% minimum rather than requiring them from every producer.

5. Should allowance be made for micro-variations such as the increased energy used when cows have to walk further, stress from being in heat, housed because of veterinary needs?
    a. The words “average” and “minimum” when applied to a whole herd of lactating cows over the grazing season(s) during a calendar year gives enough room for these small day to day variances.
    b. If these small variances affect achieving the **minimum,** the producer should be looking at management and changes to the pasture system to determine how s/he can easily reach the average of 30%.

Attachment:
1. Feed Calculation worksheet (legal size)
2. Dry Matter calculation and Walking Energy requirements by Kathy Soder, USDA ERS
3. Pasture consumption calculation by Lisa McCrory

Farm and/or Group Name **Month _______** **Year______**

Please use a separate sheet for each group or herd of cows

Is the Calculation of feed fed on an As Fed or Dry Matter basis? Please circle one. **As Fed** **DM**

Columns marked with an * are optional

	Stored Feeds Record								Pasture Record						Production Record*			
Day	lbs of grain /cow	lbs of forage #1 or No. of bales/cow or group	lbs of forage #2 or No. of bales/cow or group	lbs of forage #3 or No. of bales/cow or group	No. of cows worth of TMR mixed/ fed	No. of cows fed TMR or in group	lbs. of refusal/cow or group *	Ref to notes below	Paddock ID-AM	Paddock ID -PM	Hills? Yes or No *	Dist. to pasture in feet *	Pasture Quality Estimate - (5 high quality-1 poor quality) *	Weather - suitability for grazing - (5 high - 1 low) *	No. of cows in tank*	lbs of milk in tank*	lbs of milk/ day *	lbs of milk /cow/day *
1																		
2																		
3																		
4																		
5																		
6																		
7																		
8																		
9																		
10																		
11																		
12																		
13																		
14																		
15																		
16																		

Notes on changes in grain, forage and/or TMR correlated to a designated number in the above column on "ref to notes below"

1	
2	
3	
4	
5	
6	

Farm or group name **Month** **Year _____**

Please use a separate sheet for each group or herd of cows																			
Is the Calculation of feed fed on an As Fed or Dry Matter basis? Please circle one.										**As Fed**	**DM**					**Columns marked with an * are optional**			
	Stored Feeds Record									**Pasture Record**						**Production Record***			
Day	**lbs of grain /cow**	**lbs of forage #1 or No. of bales/cow or group**	**lbs of forage #2 or No. of bales/cow or group**	**lbs of forage #3 or No. of bales/cow or group**	**No. of cows worth of TMR mixed/ fed**	**No. of cows fed TMR or in group**	**lbs. of refusal/cow or group ***	**Ref to notes below**		**Paddock ID-AM**	**Paddock ID -PM**	**Hills? Yes or No ***	**Dist. to pasture in feet ***	**Pasture Quality Estimate - (5 high quality-1 poor quality) ***	**Weather - suitability for grazing - (5 high - 1 low) ***	**No. of cows in tank***	**lbs of milk in tank***	**lbs of milk/ day ***	**lbs of milk /cow/day ***
17																			
18																			
19																			
20																			
21																			
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31																			

Notes on changes in grain, forage and/or TMR correlated to a designated number in the above column on "ref to notes below"
1
2
3
4
5
6

Calculating Dry Matter

Importance of Dry Matter Content

Dry matter intake (DMI) is defined as the amount of feed a cow consumes after the water has been removed. While many farmers are used to dealing with feed in its 'As Fed' form (as it comes out of the silo, pasture, or bin, with the water in it), cows are consuming nutrients, not pounds of feed, and these nutrients must be calculated as DM, for an accurate estimate of nutrient intake. Comparison of feeds on a DM basis allows feeds to be compared on an equal moisture-free basis (for example, if comparing the nutritive value of grass silage vs. grass hay).

NOTE: **Forage analysis results will always be more accurate than book values for DM content. If at all possible, use actual DM values, particularly for fresh and ensiled feeds, which can be quite variable. Use of incorrect book values could result in *overestimating pasture intake*, potentially not meeting the 30% minimum DMI requirement. Additionally, using incorrect DM values can result in other problems associated with imbalanced rations, including *decreased milk production* and *impaired cow health*.**

Calculating Dry Matter from 'As Fed' Values

To calculate the amount of DM from the known 'As Fed' amount and DM %:

Example: 20 lb. of hay 'As Fed' which is 90% DM (based on forage analysis) is fed to a cow.

How many lb. of DM did you feed?

20 lb. x 0.90 = 18.0 lb. of DM

NOTE: The DM percentage (in this example, 90%) must be divided by 100 (90 ÷ 100= 0.90)

NOTE: Always remember that the DM value will be *smaller* than the 'As Fed' value because the water content was removed.

Calculating 'As Fed' from DM Values

Example: Your ration calls for feeding 10 lb. DM of hay (with a known 90% DM content) to each cow. How many lb. is that on an 'As Fed' basis?

10 lb. ÷ 0.90 = 11.1 lb. of hay 'As Fed'

NOTE: Always remember that the 'As Fed' value will be *larger* than the DM value because the water content was "added" back in, as it would be weighed on a farm scale.

What if DM is Estimated Incorrectly? (Example)

We have 1000 lb. cows producing 45 lb. of milk that will consume approximately 35 lb. of total DM (from pasture and stored feeds) per cow per day.

We want to feed a very simplistic ration consisting of:

- 60% DMI from grass silage
- 10% DMI from grass hay
- 30% DMI from pasture.

Using book values, we estimate DM of the silage as 28% and the hay as 90% DM.

Silage

DM = 0.60 x 35 lb. total DMI = 21 lb. DMI from silage
'As Fed' = 21 lb. DM ÷ 0.28 = 75 lb. silage 'As Fed'

Hay

DM = 0.10 x 35 lb. total DMI = 3.5 lb. DMI from hay
'As Fed' = 3.5 lb. DM ÷ 0.90 = 3.9 lb. hay 'As Fed'

By difference, pasture DMI = (35 total DMI – 21 lb. DM silage– 3.5 lb. DM hay) = 10.5 lb.DMI from pasture

(10.5 lb. DM from pasture ÷ 35 lb. total DMI) x 100 = <u>30% total DMI from pasture.</u>

We later obtain a *forage analysis*, where the silage DM is actually 35%.

<u>If we're feeding 75 lb. 'As Fed' silage based on our previous calculations, how many lb. of actual DM are we feeding?</u>

75 lb. x 0.35 = 26.3 lb. of DM *actually* consumed from silage. **(75% of total DMI)**

This means that the cows are obtaining 5.3 lb. more DM from silage (26.3 – 21.0) than we first estimated, or, 5.3 lb. ***less*** pasture DMI than first estimated. What does this do in relation to the pasture intake organic standard?

((Silage DMI + Hay DMI) ÷ Total DMI) x 100 = % DMI from stored feeds

((26.3lb. + 3.5 lb.) ÷ 35 lb.) x 100 = 85% total DMI from stored feeds

100% total DMI - 85% DMI from stored feeds = <u>15% DMI from pasture</u>

Pasture DMI was *grossly overestimated* using book values, and, based on the proposed organic pasture standards, this farm would not be meeting the minimum 30% pasture DMI guidelines.

Table 1. Average book values for DM% of commonly fed dairy feeds (Adapted from NRC, 2001; Dairy Reference Manual, 1995).

Feed	DM (%)*
Cool-season grass pasture	18-28
Legume pasture	18-28
Silage (grass, corn)	28-40
Hay (grass, legume)	90
Barley, Wheat	89
Corn, dry	88
Corn, high moisture	74
Soybean meal, 48%	90

* Values will vary widely, particularly with ensiled and fresh feeds. Use forage analysis results when possible.

Energy Requirements of Grazing Activity

The amount of energy Net Energy for Lactation (NE_L) required for grazing activity is listed below in Table 1. Grazing activity is a function of body weight (BW), distance walked between pasture and parlor, and topography of the pasture. The equations used to calculate these values assume that dry matter intake (DM) is ‘normal’ for the given body weight and that pasture is 60% of the total DMI.

Table 1. Estimated NE_L requirements (Mcal/day) associated with grazing flat or hilly ground for an average Jersey cow (1000 lbs) and an average Holstein cow (1400 lbs). Adapted from NRC (2001).

Total distance, parlor	BW = 1000		BW = 1400	
to paddock, miles/day	‘Flat’	‘Hilly	‘Flat’	‘Hilly
0.25	0.63	3.33	0.88	4.66
0.50	0.71	3.41	0.99	4.77
0.75	0.79	3.49	1.11	4.89
1.00	0.88	3.58	1.23	5.01
1.25	0.96	3.66	1.34	5.12
1.50	1.04	3.74	1.46	5.24
1.75	1.12	3.82	1.57	5.35
2.00	1.21	3.91	1.69	5.47

High-quality pastures (cool-season grasses or legumes) typically contain **0.69 – 0.72 Mcal/lb of DM.

Approximately 0.31 Mcal NE_L is required for each pound of 3.5% milk produced (or 0.33 Mcal for 4.0% milk). Therefore, if we assume that DMI and nutrient intake remains the same (which it may or may not), a 1000 lb. cow that has to walk on flat ground 2 miles/day may drop in milk by 2-4 lb. in milk (1.21/0.31).

A 1400 lb. cow walking on hilly ground 2 miles per day may drop in milk production by more than 10 lb./day (5.47/ 0.31 = 17.6 lb of milk lost) if additional energy (or DMI) does not make up the difference for this increased activity.

Measuring 30% DM from Pasture
By Lisa McCrory

Current USDA National Organic Program Regulations require access to pasture for all ruminant animals [§205.237, §205.239] (*see end of article for exact wording).* USDA Accredited certifiers have been enforcing this standard since the inception of the program in 2002. The current rule, however, lacks measurable standards and has led the USDA /NOP to say that the current standard is unenforceable and as a result, organic dairy farms are not being treated equally. Producers and consumers alike have not been happy about the lack of enforceable standards. Knowing that there are organic dairies selling milk as organic and *not* using pasture sends a confusing message to consumers and threatens the health and potential growth of the organic dairy industry.

In April 2006, USDA/NOP invited producers, certifiers, resource individuals and industry representatives to participate in a pasture symposium. This meeting was intended to assist the USDA/NOP in understanding the importance of pasture on organic farms and to develop standards for pasture that were reasonable and enforceable within an organic system plan.

At that meeting, the majority of the certifiers and farmers agreed that specific and quantifiable pasture standards were necessary and could easily be documented using current record-keeping regimes of certified organic livestock farmers. The following standard has been approved by producer organizations, advocacy groups, processors and certifiers throughout the United States: *"Ruminant livestock must graze pasture for the growing season but not less than 120 days per year. The grazed pasture must provide a significant portion of the total feed requirement but not less than 30% of the dry matter intake on an average daily basis during the growing season." This wording was also voted on and approved by the NOSB in 2005 as a guidance document for certifiers.*

Because a measurable higher standard has not yet been adopted by the NOP, Organic Valley/CROPP has developed higher standards, which were voted and approved by their producer members. Organic Valley is now requiring that the producer's farm plan includes a provision that "ruminant animals over 6 months of age receive a … minimum of 30% of their dry matter intake from pasture for a minimum of 120 days per year".

In anticipation of a measurable pasture standard, Vermont Organic Farmers (VOF), the certification arm of NOFA-VT, and NOFA-NY Certified Organic LLC have included a section in their application forms that allows a producer to evaluate their pasture use. These forms help the certifier and the producer determine if the NOSB recommendation of 30% dry matter and 120 days is being met. If a producer is not meeting the 30% minimum requirement, they are asked to justify their management and in some cases to increase their pasture acreage.

Other Northeast certifiers (MOFGA Certification Services LLC, Baystate Certifiers, and Pennsylvania Certified Organic) do not provide any record keeping forms that evaluate dry matter intake from pasture at this time. Don Franczyk of Bay State Certifiers said that they are taking the 'wait and see' approach; when the NOP presents their proposed standard, they will move forward with the necessary paperwork for documentation. At this time, Bay State Certifiers has 6 certified dairies in Massachusetts and Connecticut, 4 of which are practically 100% grass-fed. MOFGA Certification Services and PCO work with their producers if they see that the producer is clearly limited in pasture for the size of their herd. They make it clear that if the NOP rule implements measurable pasture requirements, their continued certification may be in jeopardy. When writing non-compliance notices to producers, MOFGA Certification Services cites the definition for pasture included in the rule which states that "pasture must provide food value and that natural resources must be maintained or improved". Certifiers have a long history with using feed calculations to red-flag potential compliance issues. For example, the 80/20 feed exemption, when calculated on an as fed basis, was based on certain assumptions about the weight of hay bales. It is also a requirement for producers to provide information on feed harvested for each production year. Certifiers must be aware that a margin of error exists in all of these calculations and realize that their best use is determining which producers need additional evaluation.

Producers are required, by any certifier, to submit an Organic Farm Plan that demonstrates how they are building soil fertility, preventing soil degradation/erosion, a description of their out-door access practices, and where their feed is coming from. From these requirements, a system is already in place to calculate intake from pasture. Pasture intake information can be determined by 'back-calculation' or by providing a ration plan for the herd during the grazing months.

To back-calculate, one compares what is fed in winter, to what is fed in the summer. The total dry matter is determined from both rations; then the summer ration is subtracted from the winter ration. The difference between those two rations would be the amount being provided from pasture. Divide the dry matter value of the pasture into the dry matter value of the winter ration and you will get your pasture %.

Example:
100 milking cows weighing an average of 1100 each. Average milk production per cow is 50 lbs/cow.

Winter ration:
50 # Haylage (40% dry matter) = 20 lbs dry matter
5 # dry hay (90% dry matter) = 4.5 lbs dry matter
15 # grain (90% dry matter) = 13.5 lbs dry matter
Total Dry Matter = 38 lbs
Summer ration:
12 # grain (90% dry matter) = 10.8 lbs dry matter
4 # dry hay (90% dry matter) = 3.6 lbs dry matter
Total Dry Matter = 14.4 lbs

Winter Ration (38) – Summer Ration (14.4) = 23.6 lbs dry matter remaining = pasture portion of the ration
To determine the % Dry Matter from Pasture: 23.6 divided by 38 = 62% of the daily ration = pasture.

To calculate the ration based upon the dry matter needs of your cows, you can also forward calculate. Dairy cattle consume approximately 3.5 % of their body weight in dry matter intake daily. Total dry matter intake can vary slightly based upon the breed and the total pounds of milk produced, but these average values will help producers and certifiers identify those farms that are close to the minimum allowances.

Example 1: a herd of 100 Jerseys weighing an average of 950 lbs each. They each need approximately 33.25 lbs dry matter per cow per day (950 x .035 = 33.25 lbs). The cows are fed 12# of grain per day (90% dry matter) and 4 # of dry hay (90% dry matter) per day to complement their pasture.

Expected dry matter intake per cow:	33.25 lbs
- minus dry matter intake from grain	-10.8 lbs
- minus dry matter intake from hay	- 3.6
Total dry matter from pasture =	18.85 lbs

To determine the % dry matter from pasture: 18.85 divided by 33.25 = 57% of the daily ration = pasture

For those producers who still like to supplement their pasture with a TMR ration, here is another calculation.

Example 2: a herd of 60 cows weighing an average of 1300 lbs. They each need approximately 45.5 lbs of dry matter per day (1300 x .035 = 45.5 lbs). The cows are fed a TMR ration that includes 40 lbs of haylage/corn silage (40% dry matter) and 14 lbs of grain (90% dry matter).

Expected dry matter intake per cow:	45.5 lbs
-minus dry matter intake from grain	-12.6
-minus dry matter intake from silage	- 16.0
Total dry matter from pasture =	16.9 lbs

To determine the % dry matter from pasture: 16.9 divided by 45.5 = 37% of the daily ration = pasture

Whether or not your certifier or processor is asking you for a pasture dry matter calculation, I recommend you work on making these determinations for your farm. Work with your nutritionist, ask your local Extension agent to help you, or contact your local organic dairy technical outreach person available through MOFGA, NOFA-VT, NOFA-NY, PCO, NOFA-Mass and NOFA-NH. It is best to know where you stand now so that you can start planning for any adjustments that may need to be implemented within the next year or so (optimistic, aren't I?). I am sure most dairy graziers will find that they are well over the 30% minimum standard, so don't be intimidated by doing the calculations for your farm; I am sure you will be pleasantly surprised.

CURRENT REGULATION AND DEFINITION:

Definition of pasture as written by the NOP in the definition section of the rule: Land used for livestock grazing that is managed to provide feed value and maintain or improve soil, water, and vegetative resources.

205.238 Livestock Health Care Standards

(a)(3) Establishment of appropriate housing, pasture conditions, and sanitation practices to minimize the occurrence and spread of diseases and parasites;

§ 205.237 Livestock feed. --

The producer of an organic livestock operation must provide livestock with a total feed ration composed of agricultural products, including pasture and forage, that are organically produced and, if applicable, organically handled:

§ 205.239 Livestock living conditions.

(a) The producer of an organic livestock operation must establish and maintain livestock living conditions which accommodate the health and natural behavior of animals, including:
(1) Access to the outdoors, shade, shelter, exercise areas, fresh air, and direct sunlight suitable to the species, its stage of production, the climate, and the environment;
(2) Access to pasture for ruminants;

Lisa McCrory works for NOFA-VT as a Dairy and Livestock Technical Advisor and operates Earthwise Farm and Forest in Bethel, VT

Attachment F:

Consumers Union
NONPROFIT PUBLISHER OF CONSUMER REPORTS

CENTER FOR FOOD SAFETY

FOR IMMEDIATE RELEASE
April 12, 2006

CONTACT: Urvashi Rangan [CU], 914-378-2211 (work) or 646-594-0212 (cell);
Charles Margulis [CFS], 510-697-0615 (cell) or 415-826-2770 (work)

New Surveys Project Drop in Organic Milk Market If Federal Agency Fails to Fix Pasture Standards

Upcoming USDA hearing of farmers, producers and retailers April 18-19 in State College, PA

Washington DC—A week before the United States Department of Agriculture (USDA) gets ready to hold a hearing on the issue, national surveys from The Center for Food Safety and Consumers Union (CU) project a significant drop in the organic milk market if consumers knew that the cows the milk came from were confined indoors and did not graze for most of their lives on pastured land. Under the existing USDA enforcement policy, producers of organic milk are not clearly required to raise their organic cows on pasture. The lack of a stringent enforcement standard has led to complaints that industrial-style confined, dairy feedlots are selling milk under the organic label.

"Because the Department of Agriculture has not clearly defined what it means for an organic dairy cow to have access to grass, some consumers are being seriously misled and buying milk that doesn't meet their expectations. They are paying a premium price believing that the cow their milk came from spent most of its life outdoors, which is healthier and more sustainable than being confined in a crowded space. But under USDA's current practices, consumers may not be getting what they are paying for," says Dr. Urvashi Rangan, Senior Scientist & Policy Analyst for Consumers Union, the nonprofit publisher of *Consumer Reports*.

"The results of the debate in State College next week not only affect consumers but all organic milk producers who want their customers to have confidence in the quality of the products they are buying. The surveys show that confidence would be severely eroded," adds Rangan.

Highlights of two nationally representative and independent surveys include:

- A survey of 1,011 of U.S. adults commissioned by the Center for Food Safety found that six out of ten women who buy organic milk and five out of ten of all organic milk purchasers would no longer do so if they knew that many organic cows were confined to fenced-in feedlots and did not graze on pasture for most of their lives.

- More than two-thirds of all consumers and 75% of women in the Consumers Union (CU) survey of 1,485 U.S. online adults said that the national organic standards should require that animals graze outdoors.
- When asked specifically in the CU survey if they would still pay a premium price for organic milk that came from cows that were confined indoors and did not graze outdoors (have access to pasture), only 14% agreed that they would (60% disagreed, while 25% remained neutral).

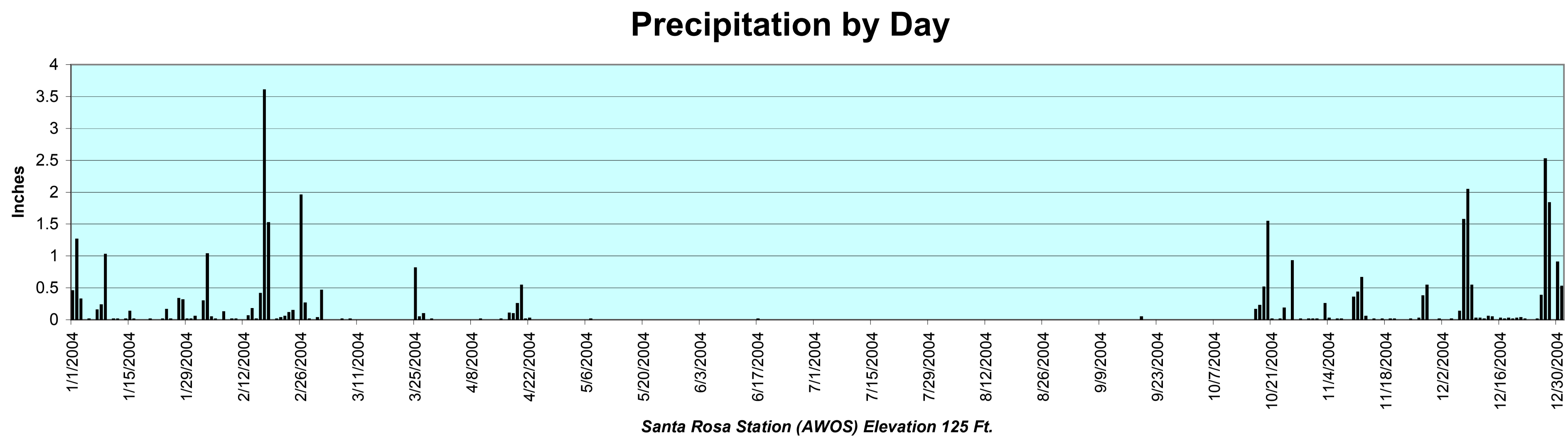
"These polls give a clear indication of consumer sentiment towards organic milk — they want and expect organic dairy cows to be raised on pasture before organic milk ends up on the grocery store shelf," said Joseph Mendelson, Legal Director for the Center for Food Safety.

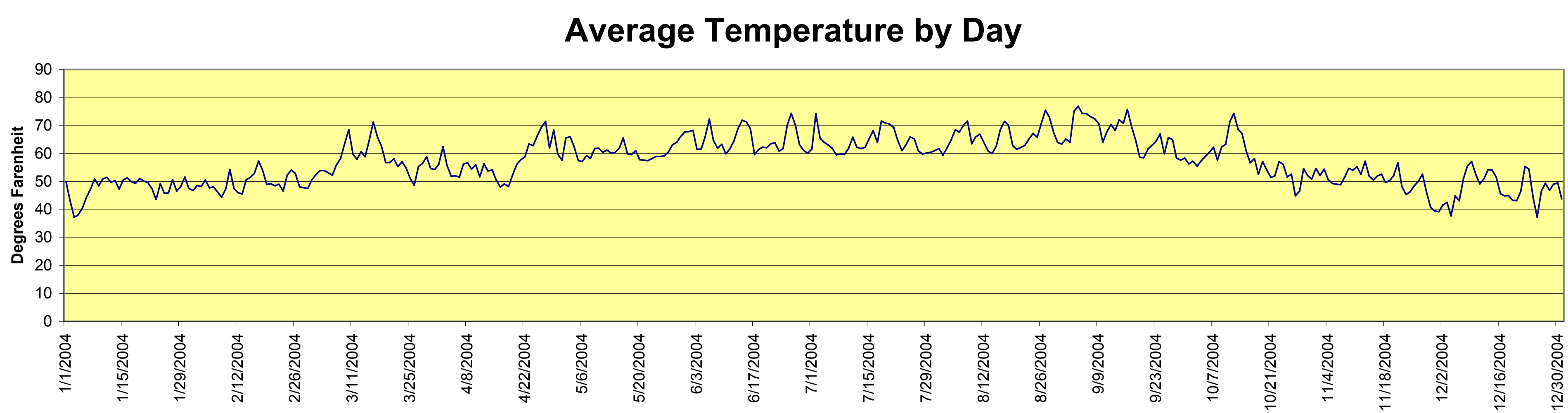
"We want the USDA and organic dairy companies to listen to consumer demand and require organic milk to come only from cows raised for a significant period time on pasture. Consumers will reject organic milk if they believe that organic is no different from factory farm milk, and that would hurt the entire organic market," Mendelson continued.

-30-

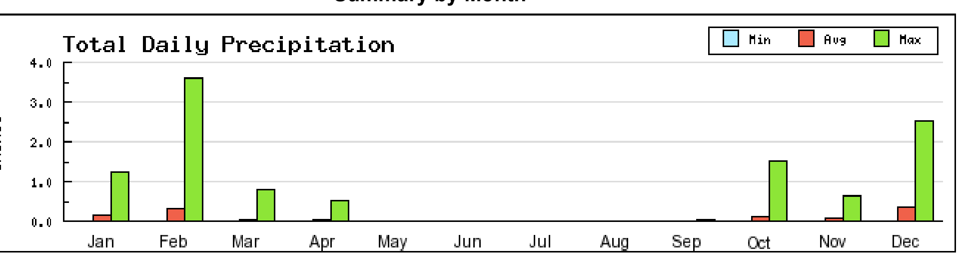
Attachment G: Precipitation graphs for Santa Rosa (CA) from 2005 to 2008

2004





Summary by Month



Annual Averages

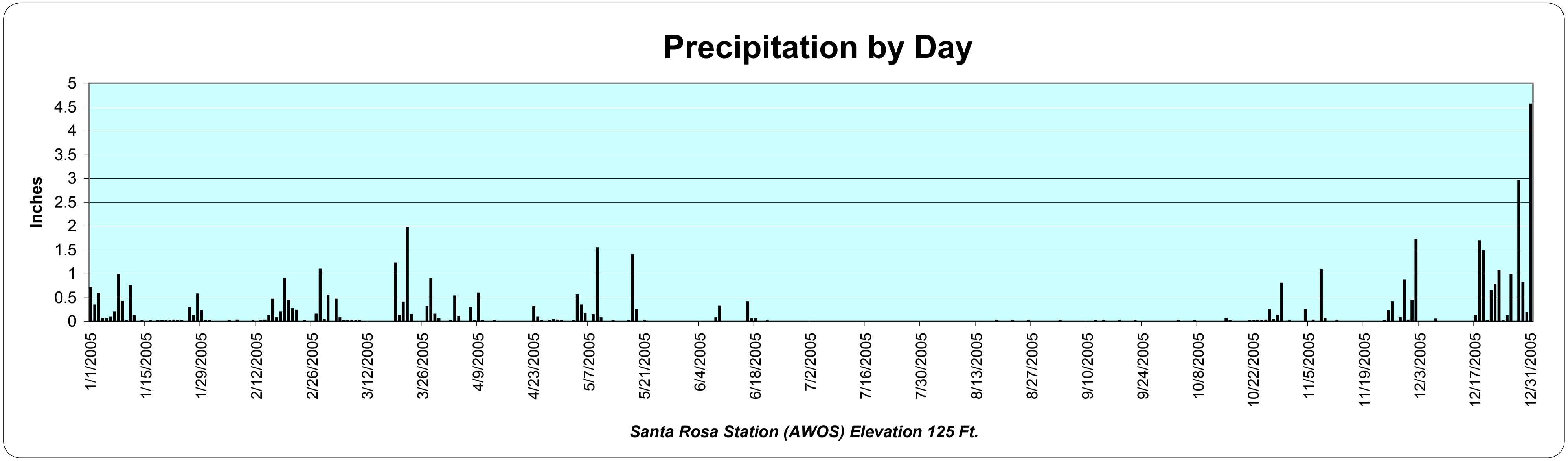
Temperature	
Coldest Temperature:	26.1°F
Average Daily Temperature:	57.5°F
Hottest Temperature:	100.0°F
Conditions	
Average Daily Precipitation:	0.09 IN
Average Visibility:	8.4 MI
Average Daily Wind Speed:	4.96 MPH
Average Sea Level Pressure:	29.98 IN

Search Summary	
Start Date:	Jan 1, 2004
End Date:	Dec 31, 2004
Number of Years:	1
Number of Days:	366 days
Results Summary	
Days in Database:	366 days
Missing Days:	0 days

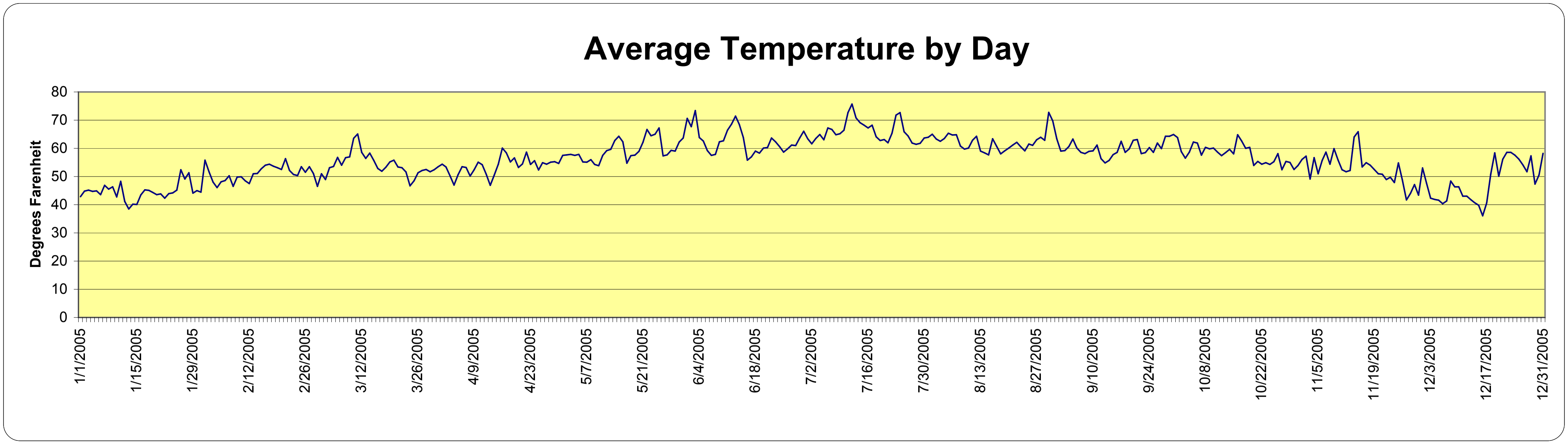
(Weather data from the National Climatic Data Center - Global Surface Summary of Day)

2005

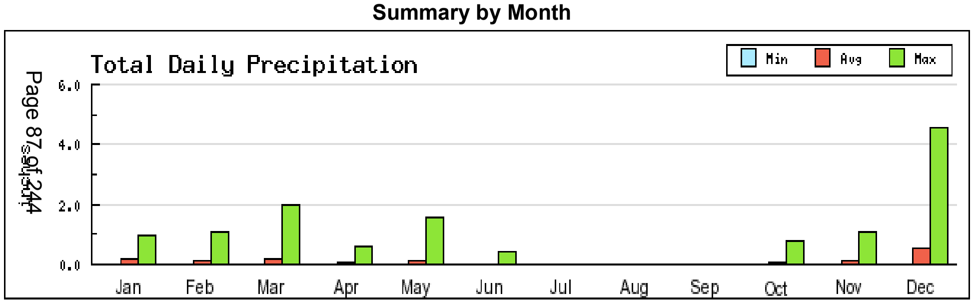
Precipitation by Day



Average Temperature by Day



Summary by Month

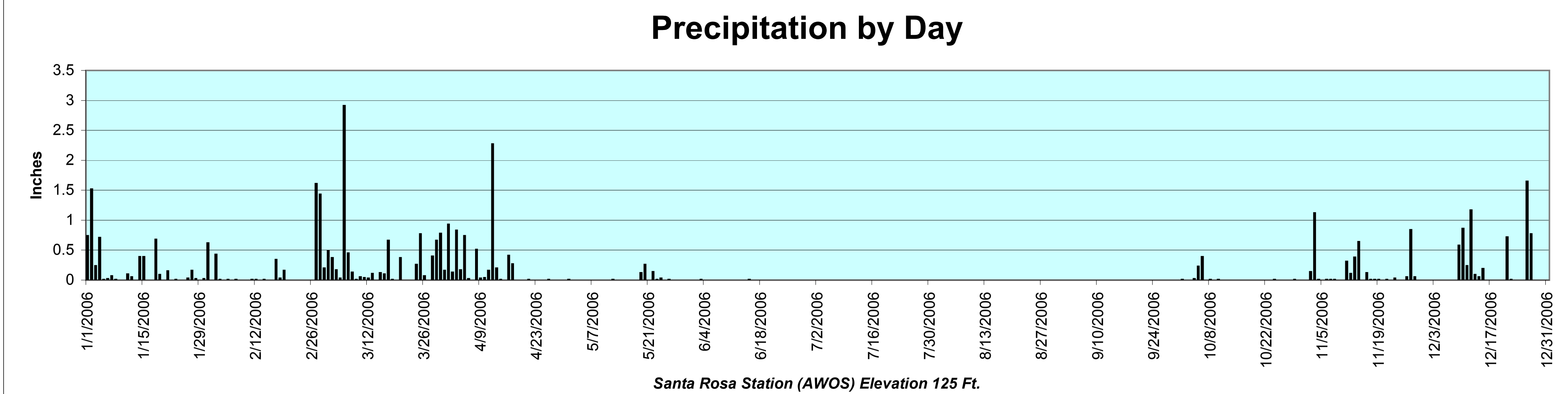


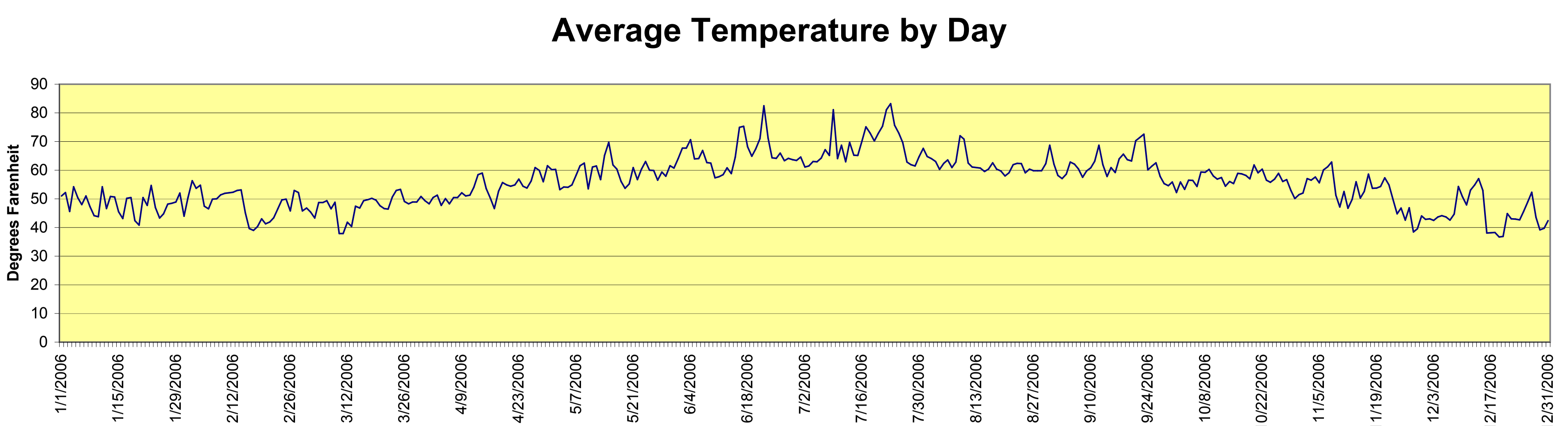
Annual Averages

Temperature		Search Summary	
Coldest Temperature:	26.1°F	Start Date:	Jan 1, 2005
Average Daily Temperature:	56.1°F	End Date:	Dec 31, 2005
Hottest Temperature:	100.9°F	Number of Years:	1
Conditions		Number of Days:	365 days
Average Daily Precipitation:	0.12 IN	**Results Summary**	
Average Visibility:	7.7 MI	Days in Database:	365 days
Average Daily Wind Speed:	4.76 MPH	Missing Days:	0 days
Average Sea Level Pressure:	29.97 IN		

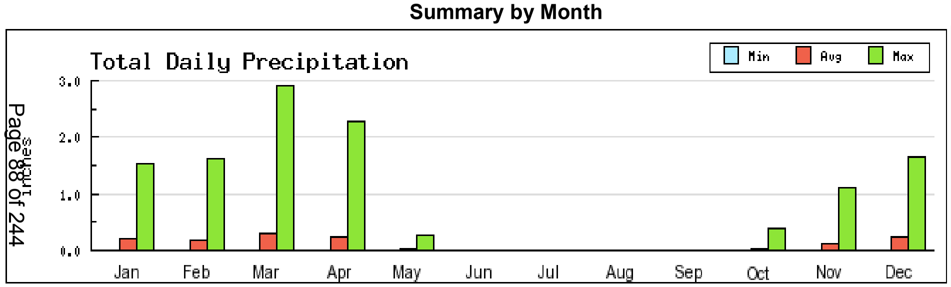
(Weather data from the National Climatic Data Center - Global Surface Summary of Day)

2006





Summary by Month



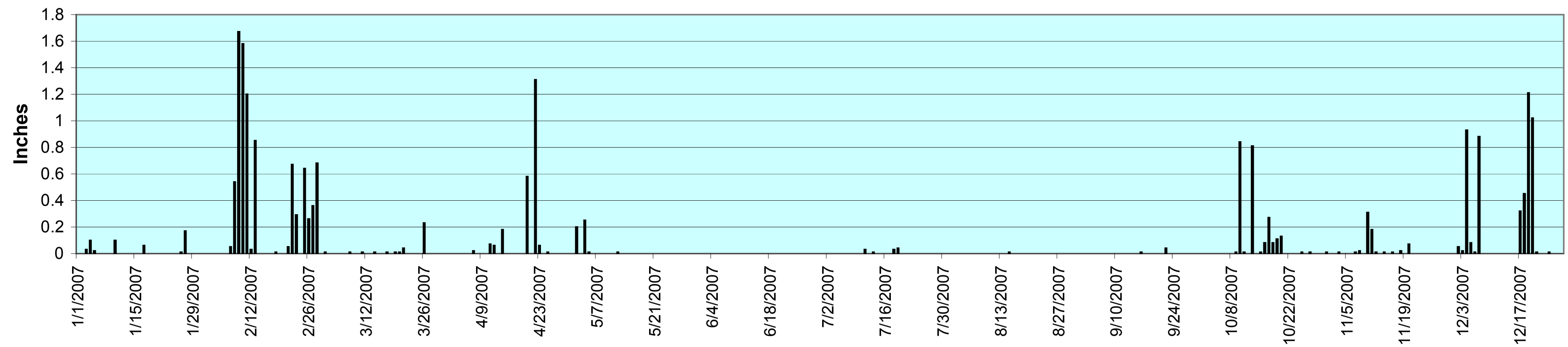
Annual Averages

Temperature		**Search Summary**	
Coldest Temperature:	24.1°F	Start Date:	Jan 1, 2006
Average Daily Temperature:	55.7°F	End Date:	Dec 31, 2006
Hottest Temperature:	108.0°F	Number of Years:	1
Conditions		Number of Days:	365 days
Average Daily Precipitation:	0.11 IN	**Results Summary**	
Average Visibility:	8.2 MI	Days in Database:	365 days
Average Daily Wind Speed:	4.17 MPH	Missing Days:	0 days
Average Sea Level Pressure:	29.99 IN		

(Weather data from the National Climatic Data Center - Global Surface Summary of Day)

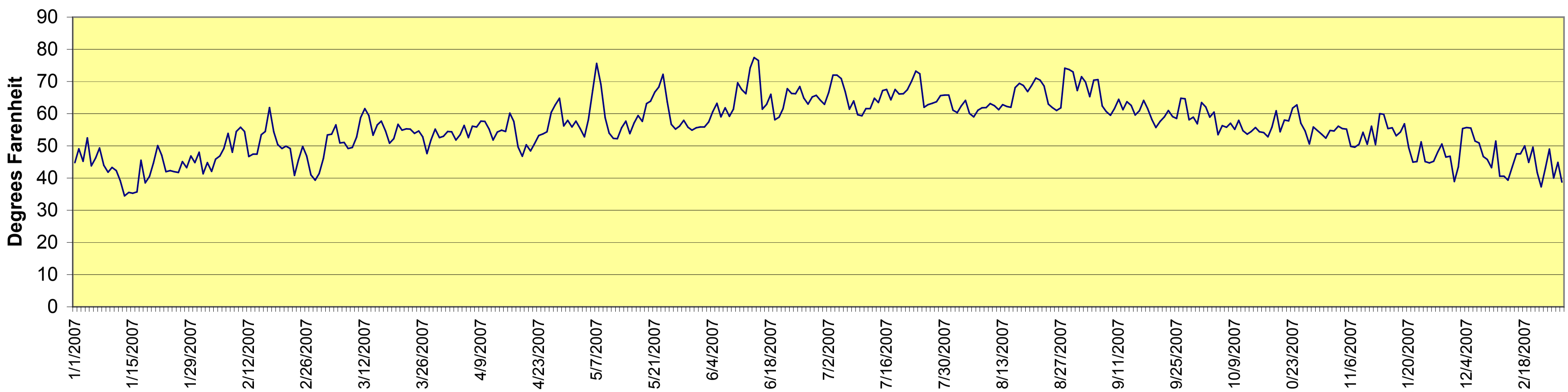
2007

Precipitation by Day

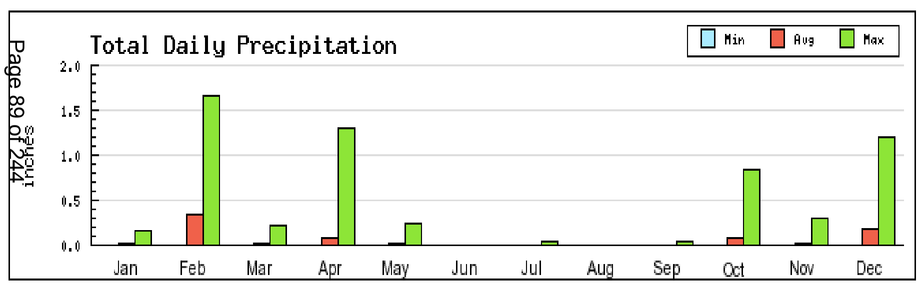


Santa Rosa Station (AWOS) Elevation 125 Ft.

Average Temperature by Day



Summary by Month



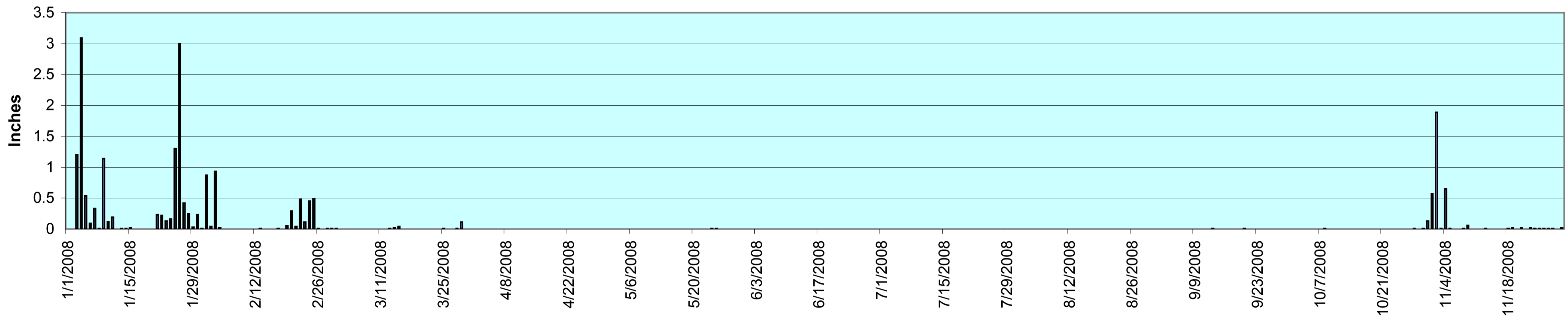
Annual Averages

Temperature		**Search Summary**	
Coldest Temperature:	19.9°F	Start Date:	Jan 1, 2007
Average Daily Temperature:	56.0°F	End Date:	Dec 31, 2007
Hottest Temperature:	100.4°F	Number of Years:	1
Conditions		Number of Days:	365 days
Average Daily Precipitation:	0.06 IN	**Results Summary**	
Average Visibility:	8.5 MI	Days in Database:	360 days
Average Daily Wind Speed:	4.52 MPH	Missing Days:	5 days
Average Sea Level Pressure:	30.01 IN		

(Weather data from the National Climatic Data Center - Global Surface Summary of Day)

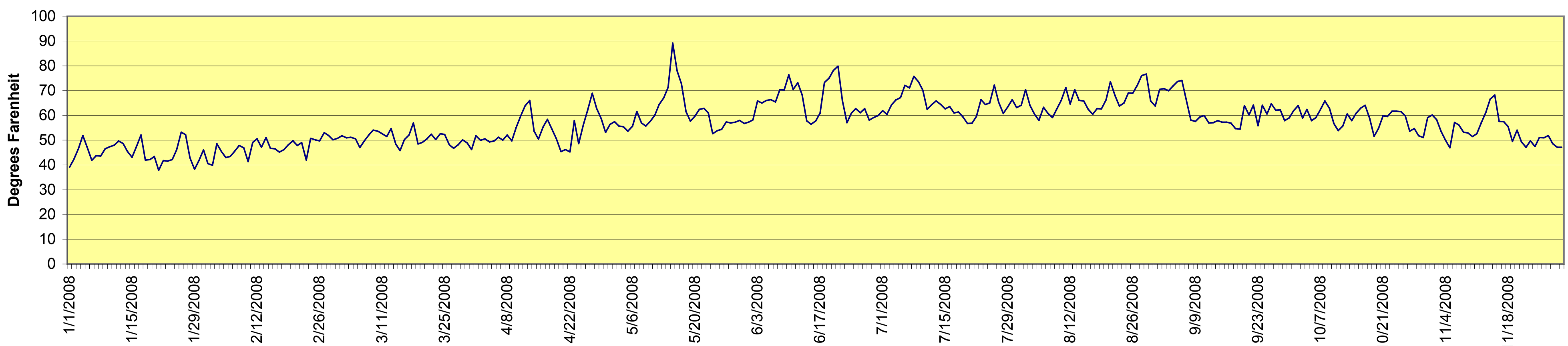
2008

Precipitation by Day

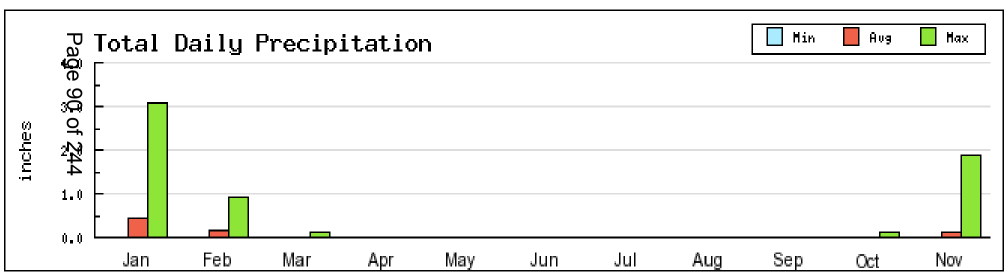


Santa Rosa Station (AWOS) Elevation 125 Ft.

Average Temperature by Day



Summary by Month



Annual Averages

Temperature		**Search Summary**	
Coldest Temperature:	26.1°F	Start Date:	Jan 1, 2008
Average Daily Temperature:	57.1°F	End Date:	Nov 30, 2008
Hottest Temperature:	102.9°F	Number of Years:	1
Conditions		Number of Days:	335 days
Average Daily Precipitation:	0.06 IN	**Results Summary**	
Average Visibility:	8.6 MI	Days in Database:	335 days
Average Daily Wind Speed:	4.66 MPH	Missing Days:	0 days
Average Sea Level Pressure:	29.99 IN		

(Weather data from the National Climatic Data Center - Global Surface Summary of Day)

Attachment H: NOSB Livestock Committee Recommendation summary

Pasture Requirements for the National Organic Program
Presented by the Livestock Committee to the NOSB

Adopted as a Board Draft for Posting
12 yes, 1 no, 1 abstain
November 17, 2005

Introduction:

On August 14, 2005, the USDA National Organic Program (NOP) returned two recommendations (Addenda B and C) for rule change adopted by the NOSB on March 2, 2005. In returning the documents, the NOP stated that the recommendations "lacked regulatory objectives." The Livestock Committee has revised the recommendations based on comments received and has expanded the "Background" section to clarify the Board's regulatory objectives.

In order to assure consumers that organic livestock products are produced to meet a consistent standard, the NOSB, as authorized by section 2110(d)(2) of the Organic Foods Production Act, recommends that 7 CFR Part 205 be amended.

The regulatory objectives of the Livestock Committee's revised recommendation are to establish pasture requirements that:

1. Are clear, consistent, and enforceable;
2. Apply to all regions of the country;
3. Are scale neutral;
4. Are attainable by organic livestock producers;
5. Protect soil and water quality and minimize soil erosion;
6. Promote the health and natural behavior of livestock; and
7. Meet consumer expectations.

1. **Background:**

The NOSB has made numerous recommendations to clarify pasture requirements for organic livestock operations. In June 2000, the NOSB recommended that, "the allowance for temporary confinement should be restricted to short-term events such as birthing of newborn or finish feeding for slaughter stock and should specifically exclude lactating dairy animals." (Preamble to Final Rule, page 80573)

In October 2001, the NOSB adopted a pasture recommendation that stated, in part:
"1. Ruminant livestock must have access to graze pasture during the months of the year when pasture can provide edible forage, and the grazed feed must provide a significant portion of the total feed requirements. The Farm Plan must include a timeline showing how the producer will work to maximize the pasture component of total feed used in the farm system.
3. The producer of bovine livestock may be allowed exemption to pasture during the following stages of production: a. Dairy stock under the age of 6 months; and b. Beef animals during final stage of finishing for no more than 120 days." (Addendum A.)

On March 2, 2005, the NOSB adopted two recommendations for rule change. The first recommendation (Addendum B) advised that the phrase "access to pasture for ruminants" at 205.239(a)(2) be changed to "ruminant animals grazing pasture during the growing season." The recommendation also contained exemptions from the pasture requirement during birthing, for dairy calves up to 6 months of age, and for finishing beef animals for no more than 120 days. The recommendation specifically prevented organic livestock operators from denying pasture to dairy cows during lactation.

The second recommendation adopted by the NOSB on March 2, 2005, (Addendum C) advised that the term "stage of production" in 205.239(a)(1) and (b)(2) be changed to "stage of life" to be consistent with the text used in 205.237(a)(2).

On August 16, 2005, the NOSB adopted a recommendation (Addendum D) for guidance clarifying the types of information to be included in a livestock operation's Organic System Plan to assess compliance with pasture requirements; the limitations of "temporary confinement"; and tools to assess "appropriate pasture conditions."

The NOSB has received thousands of comments in support of its draft recommendations. The preponderance of supportive comments have been submitted by dairy producers and consumers, stressing the environmental, animal health, and nutritional benefits derived from pastured ruminants.

Several comments have been received in opposition to NOSB draft recommendations. Those comments focused on the need for flexibility in pasture requirements in order to expand the number of acres in organic production.

The Livestock Committee has reviewed scientific studies concerning the health impacts of pasture vs confinement systems. The committee also reviewed studies on the nutritional qualities of products from pastured animals compared to products from confined animals.

The Livestock Committee reports the following:

1. Addendum E contains citations to scientific studies that document the benefits to animal health when ruminants are pastured. For example, pastured cows had lower somatic cell counts (SCC), fewer services per conception, and shorter calving intervals than confined cows. Udder diseases, including clinical mastitis, udder edema, and teat injuries were consistently less in herds managed on pasture compared with herds managed in confinement. In another study, researchers found fewer hoof disorders and eye disease in pastured vs. confinement herds.
2. Addendum E also cites studies showing benefits to food safety and milk quality from pastured animals. For example, pastured herds had lower bulk milk total bacteria counts than confinement herds.
3. Nutritional benefits of products from pasture-raised livestock are also cited in Addendum E. One study found that organic milk was 50% higher in Vitamin E, 75% higher in beta carotene and higher in omega 3 essential fatty acids than conventional milk. This study tied these qualities to organic cows having room to graze and a diet high in fresh grass and clover, and forage and less maize (corn). Intensively pastured cows produced milk with CLA concentrations that were about 3- to 4-fold greater than initial concentrations. Ribeye steaks from cattle finished on a combination of pasture and concentrate were higher in CLA content than steaks from cattle finished on conserved forages plus concentrates.
4. Addendum F cites research on the soil benefits from grazing dairy cows. As stated, grains used for livestock feed are all annuals and the soil must be tilled and planted each year, causing erosion from the tilled soil, carbon release from plowing, and the loss of organic matter. When pastured, the cows' manure is deposited on the sod where it is incorporated immediately into the soil by the biological life of the soil. In confinement operations not only is the feed stored but also the manure must be stored, with the eventual loss of gasses such as ammonia and sulfur dioxide. In addition, pasture secures the soil with its root mass to protect it from erosion caused by wind and rain.

2. **Final Rule Citations Relevant to Pasture (*emphasis added*)**

205.2 Terms defined.

Pasture. Land used for livestock grazing that is managed to provide feed value and maintain or improve soil, water, and vegetative resources.

3. § 205.203 Soil fertility and crop nutrient management practice standard.

(a) The producer must select and implement tillage and cultivation practices that maintain or improve the physical, chemical, and biological condition of soil and ***minimize soil erosion***.

4. § 205.237 Livestock feed.

(a) The producer of an organic livestock operation must provide livestock with a total feed ration composed of agricultural products, ***including pasture and forage***, that are organically produced and, if applicable, organically handled: Except, That, nonsynthetic substances and synthetic substances allowed under § 205.603 may be used as feed additives and supplements.

205.238 Livestock health care practice standard.

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

(3) Establishment of appropriate housing, ***pasture conditions***, and sanitation practices to minimize the occurrence and spread of diseases and parasites;

205.239 Livestock living conditions.

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

(2) ***Access to pasture for ruminants***:

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

(1) Inclement weather;

(2) The animal's stage of production;

(3) Conditions under which the health, safety, or well being of the animal could be jeopardized; or

(4) Risks to soil or water quality.

5. **Preamble to the Final rule – Citations Relevant to Pasture**

"The definition of "pasture" we included emphasizes that livestock producers must manage their land to provide nutritional benefit to grazing animals while maintaining or improving the soil, water, and vegetative resources of the operation. The producer must establish and maintain forage species appropriate for the nutritional requirements of the species using the pasture." Preamble page 80571

"A producer must provide livestock with a total feed ration composed of agricultural feed products, including pasture and forage that is organically produced." Preamble page 80572

"In the final rule, temporary confinement refers to the period during which livestock are denied access to the outdoors. The length of temporary confinement will vary according to the conditions on which it is based, such as the duration of inclement weather. The conditions for implementing temporary confinement for livestock do not minimize the producer's ability to restrain livestock in the performance of necessary production practices. For example, it is allowable for a producer to restrain livestock during the actual milking process or under similar circumstances, such as the administration of medication, when the safety and welfare of the livestock and producer are involved." Preamble page 80574

Recommendation:

The NOSB reaffirms its support for the positions taken by the Board in June 2000 and October 2001, as stated above, and the recommendations adopted by the Board on August 16 and March 2, 2005.

In revision, the NOSB recommends the following:

1. The NOSB recommends that §205.239(a)(2) be amended to read:

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

(2) ~~Access to pasture for ruminants;~~ Ruminants shall graze pasture for at least 120 days per year, except during the following stages of life;

(i) birthing;
(ii) dairy animals up to 6 months of age; or
(iii) beef animals during a final finishing stage not to exceed 120 days.

2. The NOSB recommends that §205.239(a)(1) be amended to read:

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

(1) Access to the outdoors, shade, shelter, exercise areas, fresh air, and direct sunlight suitable to the species, its stage of ~~production~~ life, the climate, and the environment;

3. The NOSB recommends that §205.239(b)(2) be amended to read:

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

(2) The animal's stage of ~~production~~ life;

4. The NOSB recommends that §205.237(b) be amended by adding a new section (7) to read:

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

(7) Prevent dairy animals from grazing pasture during lactation, except as allowed under §205.239(b).

Committee vote:

4 yes, 1 no, 1 absent

Addendum A: NOSB Recommendation – Adopted October 17, 2001
Pasture
Livestock Committee Recommendation
October 17, 2001

The NOSB Livestock committee puts forth the following proposed wording as a clarification for the present "access to pasture for ruminants" in the Final Rule. The following addresses what we see as the intent, the benefits, the recommended standard and the references in the NOP Final Rule related to the requirement of pasture for ruminants.

Intent:

The intent of requiring pasture for ruminants is to ensure an organic production system that provides a living condition that allows the animal to satisfy their natural behavior patterns, provides preventative health care benefits and answers the consumer expectation of humane animal care. The intent is to incorporate a pasture plan as a required part of the organic livestock system plan.

Pasture management fulfills an integral role in nutrition, health care and living condition requirements of organic ruminant production. Pasturing represents a complex task of applying the organic principles to an organic livestock operation. Pasture management in recent decades has evolved and like organic also requires a management plan for effective implementation.

Organic pasture management reflects a synthesis of crop and livestock production principles that works from the soil up to promote an interdependent community of plants and ruminants. Organically managed pasture should produce the quantity and quality of edible plants suitable to the species, stage of production, and number of animals. Pasture contributes to preventive health care management by enabling ruminants to develop and reproduce under conditions that reduce stress, strengthen immunity, and deter illness. Pasture affords ruminants the freedom of choice to satisfy natural behavior patterns. Pasture assures a relationship between the animal and land that satisfies both organic principles and international standards for organic livestock.

Benefits:

Pasture provides many benefits to the organic livestock farm. Significant benefits gained by pasturing ruminants are in the following areas:

Herd health -- Common benefits associated with pasture are improved feet and leg strength, less breeding problems, lower culling rates and enhanced immunity.

Environmental-Animals walking to pasture saves non-renewable energy, reduces equipment needs, spreads manure out naturally avoiding concentration of manure. Water pollution is a primary concern of organic consumers and concentrated manures from livestock production can be a major source of pollution to water sources.

Production-Pasturing can be as productive as dry lot production. While pasture may not produce record amounts of milk or the fastest growth rate for beef animals, net returns are favorable when all factors are measured.

Consumer expectation-The public comment from the two proposed rules shows a clear expectation that consumers have for pasture for ruminant livestock as part of humane livestock practices. There are food health and safety benefits from pasture produced livestock products that are important to the organic consumer.

NOSB LIVESTOCK COMMITTEE RECOMMENDED STANDARD

ACCESS TO PASTURE FOR RUMINANTS:

1. Ruminant livestock must have access to graze pasture during the months of the year when pasture can provide edible forage, and the grazed feed must provide a significant portion of the total feed requirements. The Farm Plan must include a timeline showing how the producer will work to maximize the pasture component of total feed used in the farm system.

2. The producer of ruminant livestock may be allowed temporary exemption to pasture because of:

a. Conditions under which the health, safety, or well-being of the animal could be jeopardized.

b. Inclement weather

c. Temporary conditions which pose a risk to soil and water quality.

3. The producer of bovine livestock may be allowed exemption to pasture during the following stages of production: [Note: recommendations for other ruminant livestock are being developed]

a. Dairy stock under the age of 6 months

b. Beef animals during final stage of finishing for no more than 120 days

Implementation issues:

Organic pasture management should respond to site-specific conditions by integrating cultural, biological, and mechanical processes that foster cycling of resources, promote ecological balance, and conserve biodiversity. Site-specific conditions in organic pasture management include the area of land available for grazing, the land’s pasture carrying capacity, its suitability to accommodate the natural behavior of the herd, and its capacity to recycle the animals' waste. Organic ruminant producers must develop an organic system plan that correlates their intended practices with the site-specific conditions on their operation. Natural variation in climate, topography, precipitation, vegetation, and breed selection may mean organic system plans may vary widely. Nevertheless, because all organic pasture systems will be managed through the consistent application of the fundamental principles of cycling resources, promoting ecological balance, conserving biodiversity and promoting livestock’s health and well being.

Organic ruminant producers must manage pasture by prioritizing the use of available resources to meet the nutritional, behavioral, and waste recycling requirements of the grazing herd. Land that normally produces stored feed may have to be converted to pasture to maximize pasture for the corresponding herd size. Producers may use allowed crop production practices such as seeding and the application of approved fertilizers and soil amendments to augment the productivity of their pasture. Conversely, producers may maintain no-input systems that provide ruminants with naturally occurring forage. The amount of producer activity is less important than the requirement that the practices that are implemented are consistent with the standards including conservation of the operation's natural resources. Organic ruminant producers will have to adapt the composition and size of their herd to the site-specific conditions of their operation.

FINAL RULE REFERENCES:

Pasture definition: Land used for livestock grazing that is managed to provide feed value and maintain or improve soil, water, and vegetative resources.

This definition leaves no question that the pasture is not an exercise lot due to the land management issues listed. Inherently this definition requires that adequate acres be supplied for the number of ruminants on the organic farm for the growing season. In order for pasture to maintain or improve soil, water, and vegetative resources it must be managed to avoid overgrazing. Pasture plants, whatever they are, can not be maintained or improved nor can they provide feed value unless the grazing system maximizes growth via the timing of the animals grazing.

Livestock health care practice:

205.238(a)-must maintain preventative livestock health care practices

Recent studies as well as practical experience by producers show significant benefits for livestock health in diverse areas including feet health, breeding, calving and improved immunity.

205.238(a)(3)-establishment of appropriate pasture conditions to minimize the occurrence and spread of diseases and parasites

The same practices that assure satisfying the definition of pasture also satisfy this requirement. Modern pasture management utilizes frequent rotation of pasture which can be timed to disrupt parasite and disease cycle.

Livestock living conditions

205.239(a)-must maintain livestock living conditions which accommodate the health and natural behavior of animals

Pasturing ruminants both satisfies this requirement and satisfies the consumer's perception of organic livestock living conditions.

205.239(a)(2)-access to pasture for ruminants

This standard combined with the definition and the above standards clearly support the requirement listed above.

Addendum B: NOSB Recommendation for Rule Change
Pasture Requirements for the National Organic Program
Adopted March 2, 2005

Introduction

The USDA National Organic Program (NOP) has requested NOSB provide guidance concerning the pasture requirements of the National Organic Program that the NOP can review and distribute to accredited certifying agents and post on the NOP website.

The following recommendation is based on the NOSB's June 2000 and October 2001 pasture recommendations and the standards currently required under the NOP regulations, attached in addenda to this document. The NOP Final Rule defines "pasture" as "land used for livestock grazing that is managed to provide feed value and maintain or improve soil, water, and vegetative resources." 7 CFR 205.2. Pasturing is required under the Livestock Health Care Practice Standard (7 CFR 205.238) and under Livestock Living Conditions (7 CFR 239). The Final Rule provides that temporary confinement is allowed in certain circumstances. This recommendation will provide further guidance on the meaning of temporary confinement and stage of life.

As stated in the October 2001 NOSB recommendation, requiring pasture for ruminants ensures an organic production system which provides living conditions that allow animals to satisfy their natural behavior patterns, provides preventative health care benefits and answers the consumer expectation of humane animal care. Organic pasture management reflects a synthesis of crop and livestock production principles that works from the soil up to promote an interdependent community of plants and ruminants. Organically managed pasture should produce the quantity and quality of edible plants suitable to the species, stage of life, and number of animals. Pasture assures a relationship between the animal and land that satisfies both organic principles and international standards for organic livestock.

Recommendation

The NOSB recommends the following:

1. Rule Change for §205.239(a)(2)

The NOSB recommends that §205.239(a)(2) be amended to read:

§205.239(a)(2) ~~Access to pasture for ruminants~~ Ruminant animals grazing pasture during the growing season.

This includes all stages of life except:
a) birthing; b) dairy animals up to 6 months of age[8] and c) beef animals during the final finishing stage, not to exceed 120 days[9]. Note: Lactation of dairy animals is not a stage of life under which animals may be denied pasture for grazing.

Board vote:

13 – yes, 1 – no, 0 - abstain

Addendum C: Recommendation for a Rule Change Amending "Stage of Production" to read "Stage of Life" Adopted by the NOSB March 2, 2005

Background

Language within The National Organic Program Final Rule (7 CFR Part 205) creates a certain amount of ambiguity regarding the applicability of specific provisions of the regulation in the lifestage of livestock.

Sections 205.239(a)(1) and 205.239(b)(2) reference "stage of production" in regard to access to outdoors and temporary confinement. Section 205.237 (a)(2) utilizes the terminology "stage of life" to describe the allowance for specific levels of feed supplements or additives.

Development of enforceable standards for "stage of production" is problematic, particularly in regard to dairy animals. While "life" encompasses the total span of an animal's life, "production" refers only to that portion of life in which the animals is producing milk.

Recommendation

The NOSB recommends a rule change to make the language in §205.239(a)(1), §205.239(b)(2) consistent with the language in §205.237(a)(2). The language, therefore in §205.239(a)(1) would read "Access to outdoors, shade, shelter, exercise areas, fresh air, and direct sunlight suitable to the species its stage of ~~production~~ life, the climate, and the environment.

§205.239(b)(2) would be amended to read "animal's stage of ~~production~~ life."

Board Vote

13 – yes, 0 – no, 0 – abstain, 1 - absent

[8] The NOSB recommends 6 months for young animals to allow for weaning and prevention of parasites. (Footnote included as explanatory text – not to be included in rule change.)

[9] The NOSB recommends 120 days for the finishing of bovines based on comments received from beef producers who indicated that 120 days is the amount of time needed to achieve "choice" grades of beef. (Footnote included as explanatory text – not to be included in rule change.)

Addendum D: NOSB Livestock Committee Recommendation for Guidance on Pasture Requirements for the National Organic Program Adopted by the National Organic Standards Board August 16, 2005

Introduction

The USDA National Organic Program (NOP) has requested NOSB provide guidance concerning the pasture requirements of the National Organic Program that the NOP can review and distribute to accredited certifying agents and post on the NOP website. The NOSB reviewed the proposed guidance from the Livestock Committee at the March, 2005 meeting, and made several changes. The NOSB then requested additional public comments on the revised guidance.

The NOSB Livestock Committee received and reviewed comments on the revised guidance. The Livestock Committee has revised the guidance to include several of the comments, including clarification of the meaning of growing season, clarification of the role of the NRCS standards, and certain grammatical issues. A minority opinion on the Livestock Committee sought the inclusion of the word "approximate" in relation to the percentage of DMI to reflect the annualized aspect of the Organic System Plan, however this opinion was not adopted by the Committee. The Livestock Committee will present this guidance to the NOSB at the August meeting and request that the NOSB recommend this guidance to the NOP. The Livestock Committee believes that the guidance, combined with the rule changes recommended at the March 2005 meeting with regard to stage of life and lactation are sufficient, and no further rule changes are recommended at this time.

Guidance for interpretation of §205.239(a)(2)

A. Organic System Plan

Ruminant livestock should graze pasture during the months of the year when pasture can provide edible forage. The Organic System Plan should have the goal of providing a significant portion of the total feed requirements as grazed feed but not less than 30% dry matter intake on an average daily basis during the growing season but not less than 120 days per year. Growing season means the time of year of pasture growth from natural precipitation or irrigation. The Organic System Plan should include a timeline showing how the producer will satisfy the goal to optimize the pasture component of total feed used in the farm system. For livestock operations with ruminant animals, the operation's Organic System Plan should describe: 1) the amount of pasture provided per animal; 2) the average amount of time that animals are grazed on a daily basis; 3) the portion of the total feed requirement that will be provided from pasture; 4) circumstances under which animals will be temporarily confined; and 5) the records that are maintained to demonstrate compliance with pasture requirements.

B. Temporary Confinement

Temporary confinement means the period of time when a ruminant is denied pasture. The length of temporary confinement will vary according to the conditions on which it is based (such as the duration of inclement weather) and instances of temporary confinement should be the minimum time necessary. In no case should temporary confinement be allowed as a continuous production system. All instances of temporary confinement should be documented in the Organic System Plan and in records maintained by the operation.

Temporary confinement is allowed in the following situations:

1) During periods of inclement weather such as severe weather occurring over a period of a few days during the grazing season;
2) Conditions under which the health, safety, or well being of an individual animal could be jeopardized, including to restore the health of an individual animal or to prevent the spread of disease from an infected animal to other animals; <u>or</u>

3) To protect soil or water quality

C. Appropriate Pasture Conditions

As a tool for the farmer and the certifier, appropriate pasture conditions can be determined by referring to the regional Natural Resources Conservation Service Conservation Practice Standards for Prescribed Grazing (Code 528) for the number of animals in the Organic System Plan.

Approved by the Livestock Committee July 12, 2005
5 Yes
0 No
0 Abstain

Amended and adopted by NOSB August 16, 2005
13 Yes, 0 No, 1 Absent

Addendum E – Scientific Studies Comparing Pasture vs Confinement Systems

Benefits to Animal Health

1. **Bela, B., G. Nagy and I. Vinczeffy. 1995. *The influence of grazing on milk production and productive lifetime.* Debrecen Agricultural University, Dept. of Animal Breeding and Nutrition. Hungary. Poster presentation at 46th Annual Meeting of the European Association for Animal Production, Prague, Czech Republic.** Pastured cows had lower somatic cell counts (SCC), fewer services per conception and shorter calving intervals than confined cows.

2. **Bendixen, P.H., B. Vilson, I. Ekesbo, and D.B. Astrand. 1986. *Disease frequencies in dairy cattle in Sweden.* Prev Vet Med. 5: 263.** Confinement resulted in increased intramammary infections, udder edema, and stepped on teats.

3. **Berghaus, R.D., B.J. McCluskey, and R. J. Callan. 2005. *Risk factors associated with hemorraghic bowel syndrome in dairy cattle.* JAVMA. 226:1700-6.** Use of pasture as part of the lactating ration during the growing season was associated with decreased risk for hemorrhagic bowel syndrome.

4. **Cornell University 2004 Dairy Farm Business Summary. www.cce.cornell.edu** . Cull rates for conventional farms were 29% whereas for organic herds of similar size, it was 22%.

5. **Eberhart, R. J., R. A. Wilson, E. Oldham and T. Lintner. 1987. *Environmental effects on teat skin microflora.* Proceedings of the 26th Annual Mtg. Natl Mastitis Council, Orlando, FL.** Populations of environmental pathogens on teat ends were lower in pastured than confined herds.

6. **Goldberg, J.J., E.E. Wildman, J.W. Pankey, J.R. Kunkel, D.B. Howard, and B.M. Murphy. 1992. *The influence of intensively managed rotational grazing, traditional continuous grazing and confinement housing on bulk tank milk quality and udder health.* J Dairy Sci. 75:96-104.** Grazed herds had lower total bulk milk bacteria counts (TBC) that confined herds did in the summer but there was no difference in the winter when all cows were confined. Trends towards fewer udder health problems in grazing herds were also observed.

7. **Pankey, J.W. 1989. *Improving milk quality and animal health by efficient pasture management.* NESARE final report. LNE89-017. http://www.sare.org/reporting/report_viewer.asp?pn=LNE89-017&ry=1989&rf=0 (last accessed 11/03/05).** Udder disease, including clinical mastitis, udder edema, and teat injuries were consistently less in herds managed on pasture compared with herds managed in confinement.

8. **Parker, W. J., L.D. Muller, S.L. Fales, and W.T. McSweeny. 1993. *A survey of dairy farms in Pennsylvania using minimal or intensive pasture grazing systems.* Prof.**

Anim. Sci. 9:159-165. Authors found fewer hoof disorders and eye disease in herds that pastured vs. confinement.

9. **Regula G., J. Danuser, B. Spycher and B. Wechsler. 2004. *Health and welfare of dairy cows in different husbandry systems in Switzerland.* Prev Vet Med. 15:247-64.** Risks for lameness and teat injuries increased with increased confinement. Skin lesions on hocks and carpal joints were decreased in cattle allowed to go out at all times rather than cows that were allowed to go out only in good weather.

10. **Rodriguez-Lainz, A. P. Melendez-Retamal, D.W. Hird, D.H. Read and R.L. Walker. 1999. *Farm- and host-level risk factors for papillomatous digital dermatitis in Chilean dairy cattle.* Prev Vet Med. 42:87-97.** Loose housed cows had a higher risk of PDD, followed by cows in freestalls or in open corrals, compared to cows on pasture all year.

11. **Somers, J.G., K. Frankena, E.N. Noordhuizen-Stassen, and J.H. Metz. 2005. *Risk factors for digital dermatitis in dairy cows kept in cubicle houses in The Netherlands.* Prev Vet Med. 71:11-21.** Factors increasing risk of digital dermatitis were: restricted grazing time, high concentrate feeding after calving, feeding by-products, infrequent hoof trimming, and housing dry cows with lactating cows before calving.

12. **Somers, J.G., Frankena, K., E. N. Noordhuizen-Stassen and J.H. Metz. 2003. *Prevalence of claw disorders in Dutch dairy cows exposed to several floor systems*. J Dairy Sci 86:2082-93.** Cows that were not grazed were at high risk for most claw disorders when compared to cows with pasture access. All herds on concrete flooring were affected by digital dermatitis.

13. **Singh S.S., W.R. Ward, K. Lautenbach, J.W. Hughes, and R.D Murray. 1993. *Behaviour of first lactation and adult dairy cows while housed and at pasture and its relationship with sole lesions.* Vet Rec 133:469-74.** Compared lying time and frequency of lying and sole disorders in pastured herd vs. housed. Pastured cows spent more time lying (which translates into more rumination time) and got up and down less frequently than housed cows. No difference in sole disorders.

14. **Waage, S., S. Sviland, and S. A. Odegaard. 1998. *Identification of risk factors for clinical mastitis in dairy heifers*. J. Dairy Sci. 81:1275-84.** Heifers kept on pasture in the summer were at a decreased risk for clinical mastitis.

15. **Washburn, S.P., S.L. White, J.T. Green, Jr. and G.A. Benson. 2002. *Reproduction, mastitis and body condition of seasonally calved Holstein and Jersey cows in confinement or pasture systems.* J Dairy Sci. 85:105-111.** There was no difference in reproductive performance between pasture and confinement herds. Pastured herds had lower body condition scores than confinement. However, confinement herds had 1.8 times more clinical mastitis than pastured and eight times the rate of culling for mastitis.

16. **White, S.L., G.A. Benson, S.P. Washburn, J.T. Green Jr. 2002. *Milk production and economic measures in confinement of pasture systems using seasonally calved Holstein***

***and Jersey* cows. J Dairy Sci. 85:95-104** Compared confinement cows on TMR vs pasture based cows. Lower milk production on pasture but decreased feed and labor costs. Also decreased culling for pasture based herds.

17. **New York Intensive Grazing Farms (Cornell Dairy Farm Business Summary).** Eight year average (1996-2003) for veterinary and treatment costs per cow were $77 for non-graziers vs. $61 for graziers.

Benefits to Food Safety and Milk Quality

1. **Bailey, G.D., B.A. Vanselow, M.A. Hornitzky, S.I. Hum, G.J. Eamens, P.A. Gill, K.H. Walker and J.P. Cronin. 2003. *A study of the foodborne pathogens: Campylobacter, Listeria and Yersinia in faeces from slaughter age cattle and sheep in Australia.* Comm Dis Intell. 27:249-57.** Prevalence of *Campylobacter* shedding among different management groups was: dairy cattle (6%), feedlot cattle (58%), pastured beef cattle (2%), mutton sheep (0%), prime lambs (8%). All dairy cattle were on pasture.
2. **Fossler, C.P., S.J. Wells, J.B. Kaneene, P. L. Ruegg, L.D. Warnick, L.E. Eberly, S.M. Godden, L.W. Halbert, A.M. Campbell, C.A. Bolin, and A.M. Zwald. 2002. *Cattle and environmental sample-level factors associated with the presence of Salmonella in a multi-state study of conventional and organic dairy farms.* J Dairy Sci. 85:105-111.** Farms with at least 100 cows were more likely to *Salmonella*-positive cattle compared with smaller farms.
3. **Huston C.L., T.E. Wittum, B.C. Love, and J.E. Keen. 2002. *Prevalence of fecal shedding of Salmonella spp. in dairy herds* JAVMA 220:645-9.** Large herd size, intensive management, use of freestalls, and use of straw bedding were associated with *Salmonella* shedding and chronic dairy herd infection.
4. **Husu, J.R. 1990. *Epidemiological studies on the occurrence of Listeria monocytogenes in the feces of dairy cattle.* Zentralb Veterinar B. 37:276-82.** Seasonal variation in shedding of *Listeria* spp. in dairy cattle was examined by collecting 3,878 fecal samples over two years. Prevalence of *Listeria* spp. and *Listeria monocytogenes* was higher during the indoor season than in samples collected from animal on pasture.

5. **Josson, M.E., A. Aspan, E. Eriksson, and I. Vagsholm. 2001. *Persistence of verocytotoxin-producing Escherichia coli O157:H7 in calves kept on pasture and in calves kept indoors during the summer months in a Swedish dairy herd.*** Fecal samples from calves kept on pasture (n=6) and calves housed indoors (n=6) were cultured monthly for five months. Fecals from calves on pasture were negative for this pathogenic *E. coli* were negative on all sampling occasions. For the indoor housed group, there were between one and six positive individuals at each sampling.
6. **McKinnon, C. H., G.H. J. Rowlands, and A. J. Bramley. 1990. The effect of udder preparation before milking and contamination from the milking plant on bacterial numbers in bulk milk of eight dairy herds. J. Dairy Res. 57:307.** Pastured herds had lower bulk milk total bacteria counts than confinement herds

Nutritional benefits of products from pasture-raised livestock

1. **Ädnøy, T., A. Haug, O. Sørheim, M.S. Thomassen, Z. Varzegi, and L.O. Eik. 2005. *Grazing on mountain pastures—does it affect meat quality in lambs?* Livestock Prod Sci. 94:25-31.** Meat from lambs raised in extensive systems on mountain range has certain qualities that may be used in promotion of local and regional products.

2. **Aurousseau, B., D. Bauchart, E. Calichon, D. Micol, and A Priolo. 2004. *Effect of grass or concentrate feeding systems and rate of growth on triglyceride and phospholipids and their fatty acids in the M. longissimus thoracic of lambs.* Meat Sci. 66:531-541.** Muscle lipids characteristic of grass fed lambs fulfilled the recommended features of human food consumption much better than that of stall fed lambs, namely CLA and C18:3n-3.

3. **Dannenberger, D., K. Nuernberg, G. Nuernberg, N. Scollan, H. Steinhart, and K. Ender. 2005. *Effect of pasture vs. concentrate diet on CLA isomer distribution in different tissues lipids of beef cattle.* Lipids. 40:589-98.** Pasture feeding resulted in significantly increased concentrations of the sum of CLA isomers in Holstein and Simmental muscle tissue.

4. **Elgersma, A., G. Ellen, H. van der Horst, H. Boer, P.R. Dekker, and S. Tammings. 2004. *Quick changes in milk fat composition from cows after transition from fresh grass to a silage diet.* Anim Feed Sci Tech. 117:13-27.** Average CLA content of milk decreased markedly within two days of switch cows from pasture ration to silage. The milk fatty acid profile of grazing cows was more favourable from a consumer health standpoint than that of silage-fed cows.

5. **Institute of Grassland and Environmental Research. 2004.** Found that organic milk has higher levels of Omega essential acids than the conventional type. Tests carried out on samples at the research centre indicated that organic milk contains two-thirds more omega 3 essential fatty acids than conventional milk.

6. **Kay, J.K., J.R. Roche, E.S. Kolver, N.A. Thomson, and L.H. Baumgard. 2005. *A comparison between feeding systems (pasture and TMR) and the effect of vitamin E supplementation on plasma and milk fatty acid profiles in dairy cows.* J Dairy Res. 72:322-32.** Milk from cows on pasture or cows feed a TMR supplemented with Vitamin E were compared. Milk from cows grazing pasture had higher CLA, vaccenic acid, and lower trans-10 fatty acids than cows on TMR with supplemental vitamin E. Unknown pasture constituents are likely responsible for the difference.

7. **Nielsen, J., T. Lund-Nielsen, and L. Skibstead. 2004. Danish Research Center for Organic Farming.** Found that organic milk was 50% higher in Vitamin E, 75% higher in beta carotene and higher in omega 3 essential fatty acids than conventional milk. This study tied these qualities to organic cows having room to graze and a diet high in fresh grass and clover, and forage and less maize.

8. **Sonon Jr, R. D. Beitz and A. Trenkle. 2004. *Improving Health Benefits of Beef & Milk: A Field Study*. A. S. Leaflet R1864, Iowa State University.** Intensively pastured

cows produced milk with CLA concentrations that were about 3- to 4-fold greater than initial concentrations. Ribeye steaks from cattle finished on a combination of pasture and concentrate were higher in CLA content than steaks from cattle finished on conserved forages plus concentrates

9. **Ward, A. T., K.M. Wittenberg, H.M. Froebe, R. Przybylski, and L. Malcolmson. 2003.** ***Fresh forage and solin supplementation on conjugated linoleic acid levels in plasma and milk.*** **J Dairy Sci. 86:1742-50**. Fresh forage, compared to conserved hay, increase milk fat vaccenic acid and CLA proportions by 15 and 22% respectively. Addition of solin seed increased these levels further to 41 and 25%.

Addendum F - Soil Benefits From Grazing Dairy Cows

The use of pasture for feeding dairy cows vs. the use of stored feeds:
By: A. Fay Benson, Grazing Educator with the Cornell University Cooperative Extension

The benefits of allowing the dairy cow to harvest her own forage through the use of "Rotational Grazing" vs. feeding the cow stored feeds is the result of a number of basic differences in how the feedstuffs are grown. In rotational grazing the forage consumed by the cow is at its peak nutrient density, this grazing stage occurs when the plant is too small physically to be harvested by agricultural machines. Stored forage is allowed to grow to the stage where it is efficient to be harvested by machine. This results in the stored feed not being as nutrient dense and in order to balance the nutrient needs of the cow more grains must be fed. It is from this basic difference that the following benefits of grazing to the environment derive from:

- Grains are all annuals and the soil must be tilled and planted each year, causing erosion from the tilled soil, carbon release from plowing and the resulted Organic Matter loss.
- The cows' manure is deposited on the sod where it is incorporated immediately into the soil by the biological life of the soil. In confinement operations not only is the feed stored but also the manure must be stored, with the eventual loss of gasses such as ammonia and sulfite (Greenhouse gasses).
- The pasture stand secures the soil with its root mass to protect it from erosion caused by wind and rain.

These benefits to the environment are recognized by USDA's Natural Resource Conservation Service (NRCS). Some of the programs that they have developed to encourage the use of pasture are:

- The **Grazing Lands Conservation Initiative** mission is to provide high quality technical assistance on privately owned grazing lands on a voluntary basis and to increase the awareness of the importance of grazing land resources.
- The **Conservation Partnership Initiative** is a voluntary program established to foster conservation partnerships that focus technical and financial resources on conservation priorities in watersheds and airsheds of special significance.
- The **Grassland Reserve Program** is a voluntary program offering landowners the opportunity to protect, restore, and enhance grasslands on their property.
- The **Environmental Quality Incentives Program** was reauthorized in the Farm Security and Rural Investment Act of 2002 (Farm Bill) to provide a voluntary conservation program for farmers and ranchers that promotes agricultural production and environmental quality as compatible national goals
- The **Conservation Reserve Program** provides technical and financial assistance to eligible farmers and ranchers to address soil, water, and related natural resource concerns on their lands in an environmentally beneficial and cost-effective manner.

The information below was taken from a paper published by the Illinois NRCS:

Impact. When falling raindrops strike bare soil, the impact causes both splash erosion and soil compaction, resulting in faster runoff and increased erosion. Good plant cover breaks the force of the raindrops, and allows the water to seep into the soil. The soil can act as a large reservoir, holding moisture, reducing flooding and enhancing water quality. Water stored in the soil promotes a greater and more consistent supply of forage.

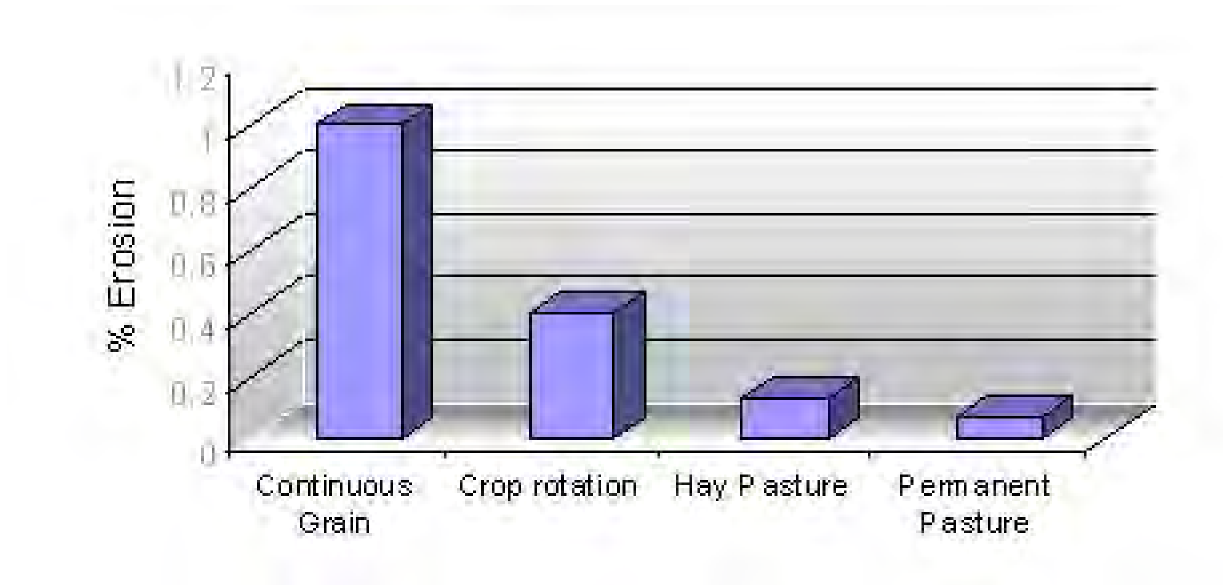
Soil. Coarse soil takes in water faster than fine soil, but stores less within the root zone of most plants. Water that moves below the root zone of plants recharges groundwater supplies, and sometimes reappears down slope as a spring or creek. Because the movement through the soil is slow, the water supply downstream is cleaner, and streams flow longer than where moisture runs off over the soil surface. Where the surface is bare, less moisture enters the soil and surfaces are hotter causing much of the stored water to evaporate during hot, windy days instead of being used for plant growth.

Plants. A healthier, more productive grassland water cycle can be achieved by proper grazing. Plants and the litter they produce affect the water cycle in several ways. Plants break the impact of raindrops on the soil surface, and serve as small windbreaks to hold snow. Plants shade the soil's surface causing the soil surface to be cooler, which creates a better environment for plant growth. Litter acts as a sponge, and slows runoff, giving moisture more time to move into the soil. Plant roots increase soil porosity so water moves more readily into and through the soil. Roots also hold soil particles in place, reducing erosion. Vigorous plant cover is an important part of influencing the grassland water cycle, and making effective use of precipitation.

Research supporting grazing over confinement housing:

Managed grazing is best way to reduce soil erosion on our productive land.
Recent **research from Wisconsin's Discovery Farms** has demonstrated that on gently sloping land, land in corn and soy production had up to six times the amount of soil erosion as managed pasture. The rate of soil erosion on the cropped land is not considered sustainable.

Ontario Ministry of Agriculture and Food, Robert P. Stone and Neil Moore Currently, the United States is losing three billion tons of nutrient-rich topsoil each year. Growing corn and soy for animal feed using conventional methods causes a significant amount of this soil loss. Compared with row crops, pasture reduces soil loss by as much as 93 percent.



Jackson, R. B., J. L. Banner, E. G. Jobbagy, W. T. Pockman, and D. H. Wall. "Ecosystem Carbon Loss with Woody Plant

It's a well known fact that trees draw carbon dioxide from the air and store it as carbon, thereby slowing the rate of global warming. But a new study from Duke University reveals that restoring native grasslands might be a better solution than planting trees in wetter areas of the country. "Grasses are deceptively productive," says lead investigator Robert Jackson. "You don't see where all the carbon goes, so there is a misconception that woody species [such as trees and shrubs] store more carbon. That's just not the case." Grasses store vast amounts of carbon in their underground root mass.

Raising cattle on grass is one way to make it financially feasible to expand our native grasslands. Although cows generate their own greenhouse gasses, the net effect of raising ruminants on pasture is to slow global warming.

Studemann, J., Fransleubbers, A., Seman, D., 2002, The Role of Animal and Pasture Management in Carbon Sequestration , USDA Agricultural Research Service, Southern Association Of Agricultural Scientists Proceedings; Carbon stored in soil during the first five years of bermudagrass management was two to three times greater when the grass was grazed than when it was harvested for hay or left unharvested.

Attachment J: Grazing Systems Planning Guide by Kevin Blanchet, University of Minnesota Extension Service; Howard Moechnig, Natural Resources Conservation Service Minnesota Board of Water & Soil Resources and Jodi DeJong-Hughes, University of Minnesota Extension Service.

Grazing Systems Planning Guide

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Grazing Systems Planning Guide

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TABLE OF CONTENTS

Introduction

This guide discusses the components of a grazing system by taking you through the grazing management planning process. Information on grazing resource inventory, plan development, pasture management, and system monitoring is provided. Each section has a series of questions that will lead you through the decision-making process of developing your plan. Your grazing plan will become customized to fit your operation depending upon how you answer the questions and integrate the components. Pasture-based livestock systems can be profitable enterprises if the available resources are managed effectively.

With approximately 16 percent of Minnesota's land in forage production, our pasture land is an important economic resource. Grazing management, such as rotational grazing that extends the amount of time that livestock can meet their needs through grazing and reduces the need for harvested feedstuffs, will lower feed costs and add to profitability.

Reducing costs and/or increasing production are the two avenues that livestock producers have for improving profitability. Focusing on management and control of production and pasture resources can be a cost reducing strategy. A well-managed rotational grazing system can reduce or eliminate the need for labor-intensive or purchased inputs such as supplemental feed, nitrogen fertilizer, and weed and brush killers. Improved pasture condition and higher forage yields can also lead to more animal production per pasture acre. Since feed costs are the major cost in almost all livestock operations, getting control of them is critical.

Designing a grazing plan is the first step in your pasture management system. As you follow the planning process, the strengths and weaknesses of your current system will become apparent. The grazing plan should include all the components of the grazing and pasture system and serve as a map for making management improvements.

Components of a typical grazing plan:

- Goals of the farming operation
- Summary of sensitive areas
- Livestock summary and forage requirements
- Fencing system
- Livestock watering system
- Heavy use area protection
- Forages
- Grazing system management

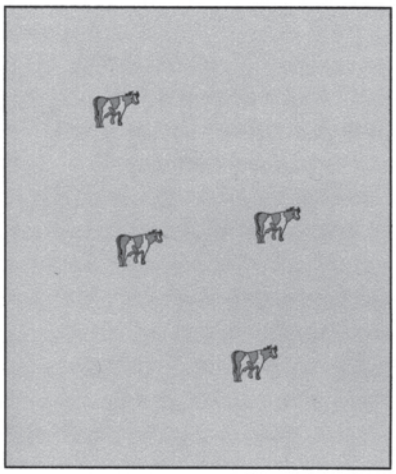
For a complete grazing plan checklist see appendix H.

Grazing systems range from continuous grazing of one area over a long period of time to intense rotational grazing on small areas for short periods of time. Livestock systems that use continuous grazing of a pasture experience both overgrazing and undergrazing of forages. A rotational system provides a rest opportunity for forage plants so that they may regrow more quickly. The rotational system provides an opportunity to move livestock based on forage growth, promote better pasture forage utilization, and extend the grazing season. The advantages and disadvantages of three grazing management systems are listed on the following page.

Grazing Management Systems

Continuous grazing

is a one-pasture system where livestock have unrestricted access throughout the grazing season.



Advantages

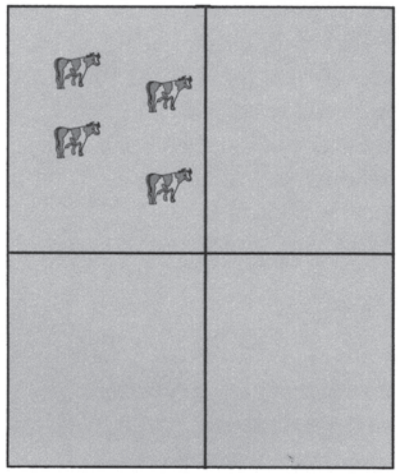
- Requires less management
- Capital costs are minimal

Disadvantages

- Lower forage quality and yields
- Lower stocking rate and less forage produced per acre
- Uneven pasture use
- Greater forage losses due to trampling
- Animal manure is distributed unevenly
- Weeds and other undesirable plants may be a problem

Simple rotational grazing

is a system with more than one pasture in which livestock are moved to allow for periods of grazing and rest for forages.



Advantages

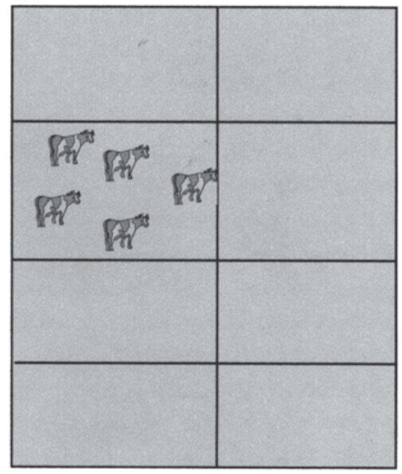
- Can increase forage production and improve pasture condition over continuous grazing
- Allows pastures to rest and allows for forage regrowth
- Can provide a longer grazing season, reducing the need for feeding harvested forages
- Better distribution of manure throughout the pasture

Disadvantages

- Costs for fencing and water systems can be higher than with continuous grazing
- Forage production and pasture utilization is not as high as intensive rotational grazing systems

Intensive rotational grazing

is a system with many pastures, sometimes referred to as paddocks. Livestock are moved frequently from paddock to paddock based on forage growth and utilization.



Advantages

- Highest forage production and use per acre
- Stocking rates can typically be increased
- More even distribution of manure throughout the paddocks
- Weeds and brush are usually controlled through grazing
- Provides more grazing options and reduces the need for mechanically harvested forages

Disadvantages

- Requires careful monitoring of forage supply
- Initial costs may be higher due to fencing materials and water distribution systems
- Requires more management

Grazing Resource Inventory

Goals

What are my goals for the grazing system?

Establish well-thought-out goals to direct the development of a grazing plan. The goals on which to base future business, management, and production strategies will be unique to your own operation.

Examples of goals include:

- Increase livestock numbers and/or forage availability
- Improve animal performance
- Reduce feed costs or labor
- Reduce soil erosion

Annually, goals should be reviewed and updated to fit the current situations and needs of the farm. After making a list of what you want to achieve with the resources you have available, you are now ready to look at the management options to accomplish your goals.

Land and Soils

What land resources are available for the grazing operation?

Locate or draw a map showing the boundaries of the land that is available for grazing.

Distinguish land that is owned from land that is rented. There are certain management practices that you can apply to your own land that you may not be able to do on rented land. Determine the number of acres of the different land parcels and label these on the map (Diagram 1).

Is there additional land available that could be used for grazing? Often, cropland that is adjacent to pasture land may be better utilized by growing forages. Cropland in close proximity to existing pastures is ideal for converting to grazing if pasture expansion is one of the farm goals. Identify and label on the map cropland that could be used for grazing.

What is the productivity of the soils?

Map soil types and soil fertility of your pastures. Soils vary considerably in their ability to support plant growth. Soil productivity is partially determined by its ability to hold water and nutrients and release them to the plant, and by how well plant roots can grow in the soil. Actual crop yields achieved are a result of the interaction between soil productivity, the level of management, and climatic factors (Diagram 2).

Aerial photos from USDA-Farm Service Agency provide a good base map

Diagram 1. Land resources map

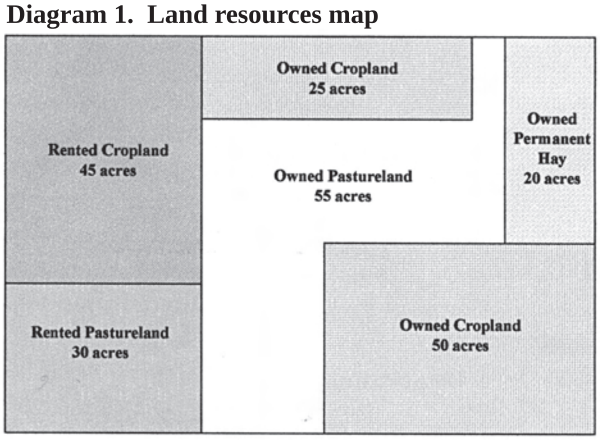
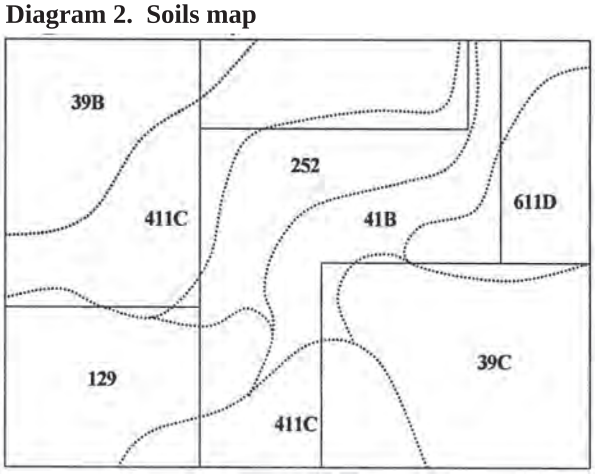


Diagram 2. Soils map



Legend

Map Symbol	Soil Name	Slope (%)	Estimated Yield (tons/acre) Grass/ Legume	Estimated Yield (tons/acre) Kentucky Bluegrass
39B	Wadena Loam	2-6	4.0	1.7
39C	Wadena Loam	6-12	3.6	1.5
41B	Esterville Sandy Loam	2-6	2.6	1.2
129	Cylinder Loam	0-2	4.0	1.7
252	Marshall Silty Loam	0-2	4.6	2.0
411C	Waukegan Silt Loam	6-12	3.8	1.8
611D	Hawick Loamy Sand	12-18	2.0	0.5

A County Soil Survey is a good first step for determining soil types in your pastures. The publication contains general characteristics of each soil type, including soil texture, drainage, water holding capacity, and organic matter content. Estimated forage yields can be calculated from "Pastures for Profit" (see References section), Appendix A, the local NRCS Forage Suitability Groups, or farm records.

Are there sensitive land areas or soil limitations for grazing in the pasture?

Sensitive land areas are areas that have a high potential to generate or transport unwanted materials towards ground or surface water. The types of materials that could contaminate these resources are bacteria, nutrients from livestock manure, and sediment resulting from soil erosion (Diagram 3).

Examples of sensitive land areas to be identified and referenced on a map:

- Location of surface waters (wetlands, lakes or streams)
- Quarries, mines or sinkholes
- Active or abandoned water supply wells
- Coarse-textured and high-leaching soils
- Steep slopes
- Shallow soil to a water table or bedrock
- Wooded areas
- Intermittent waterways

Limiting features also need to be identified and referenced on a map. The most important source of information is observed by walking the pasture with somebody that is knowledgeable in soils and soil management. The Soil Survey publication for your county will also provide additional information on pasture features found below the soil surface.

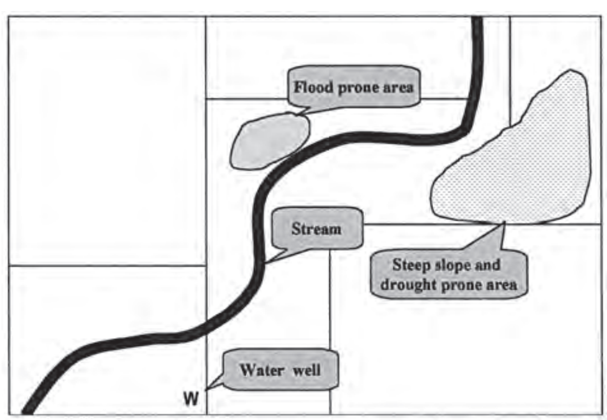
Examples of soil limiting features:

- Sandy soils which have a high potential for drought
- Shallow soils over bedrock that limit the depth of root growth
- Flood-prone soils that either restrict growth of certain forages or limit grazing time
- Organic soils which limit accessibility and ability to withstand traffic
- Extreme slopes or landscapes that make pasture areas difficult to reach

County soil information and maps can be obtained from your local USDA Agricultural Service Center or Extension office.

For help identifying these areas of your pasture, contact your local USDA Agricultural Service Center or Extension office.

Diagram 3. Sensitive areas and soil limitation area map



Livestock

What are the forage requirements for each livestock herd?

First, estimate the daily requirement for your herd:

(# of animals) x (average weight) x (daily utilization rate)
= daily forage requirement

Daily utilization rate = 0.04. This figure is used because livestock need to have access to approximately 4% of their live weight in forage (2.5% intake, 0.5% trampling loss, and 1% buffer).

Example:
(25 cow/calf pairs) x (1,200 lb. average weight) x (0.04) = 1,200 lbs/day

The daily forage requirement is used in Section 3, **Grazing Plan Development, Paddock Design and Layout.**

Second, estimate the monthly and seasonal requirements for your herd:

(daily forage requirement) x (# of days per month)
= monthly forage requirement

Example:
(1,200 lbs/day) x (30 days) = 36,000 lbs. monthly forage requirement

(daily forage requirement) x (# of days in the grazing season)
= seasonal forage requirement

Example:
(1,200 lbs/day) x (150 days) = 180,000 lbs. seasonal forage requirement

The **Livestock Forage Monthly Balance Sheet** (Table 1 and Appendix A) provides a simple method of computing monthly forage requirements.

Remember, the primary goal of most livestock grazing systems is to produce weight gain on the livestock. An increase in animal size will result in an increase in estimated forage needs through the grazing season as long as animal numbers do not change. Adjust livestock weights for each month to provide a more realistic estimate of forage needs.

Table 1. Livestock Forage Monthly Balance Sheet – Current Livestock Summary

				Forage Requirements Per Month (lbs. x 1000)					
Kind/Class Livestock	Number of Animals	Average Weight	Monthly Utilization*	May	June	July	Aug	Sept	Oct
Beef cow/calf	25	1200	1.2	36.0	36.0	36.0	36.0	36.0	36.0
Herd bull	1	2000	1.2			2.4	2.4	2.4	2.4
Totals	26			36.0	36.0	38.4	38.4	38.4	38.4

* 0.04 daily utilization rate (includes forage waste) x 30 days/month

What are the plans for potential expansion of the livestock operation?

If an increase in herd size is a goal of the operation, estimate what adjustments to forage will be needed and consider how to best meet those needs with forage supply. Are there enough acres in the existing pasture to meet the needs of the larger livestock herd? What is the potential forage supply if improvements are made to the pasture or grazing system? This issue will be addressed in following section on forages.

How many herds will be grazed?

Separating the grazing herd into groups based on production, animal species, animal size, or class differences should be examined. When there is an increase in the number of herds, you will need to increase the number of paddocks. When dividing the pasture consider:

- How many groups could potentially be grazing at the same time?
- Can the different groups graze next to each other? (Don't place male animals in paddocks adjacent to females in heat.)

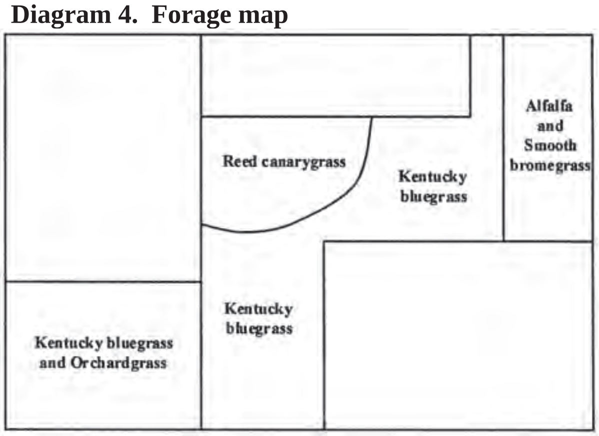
Forages

What are the existing forage species in the pasture?

Forage grass and legume species each have their own unique growth, persistence, and quality characteristics. Because they respond differently to soil conditions, weather patterns, fertility, and grazing management, the plants that are currently growing in your pastures may be different from one area to another. **Identify dominant plant species and areas in which they grow on your pasture map**. A walk through the pastures is necessary to gather this information. The plants you find during the initial inventory of your forage species may or may not be the desired species for meeting the long-term goals of your grazing system. Therefore, information on forage species growing in the pasture may have an impact on future modifications to the grazing system (Diagram 4). Identification keys for grass and legume species are readily available in Appendix B. Grass species are often difficult to identify during early stages of growth. Still, there is a need to distinguish between grass species because of potential differences in forage yield and seasonal growth patterns.

Assistance in identifying your forage species can be obtained at your local USDA Agricultural Service Center or Extension office. To collect plant samples for later identification, dig several plants along with roots, and place them between sheets of newspaper. Remove all soil from the roots before placing on the newspaper. To aid the plant drying process, apply an even pressure or weight to the newspaper.

Diagram 4. Forage map



How healthy or in what condition is the pasture?

Good pasture condition is critical to a successful grazing system. Pasture quality may vary greatly from one pasture area to another, but the trend over time should show the direction in which the pasture condition is moving. Determining Grassland Condition/Trend (Appendix C1) is an evaluation tool to help determine if pastures are in need of improvement and what areas need the most improvement. It is also a useful tool in evaluating results of management decisions. **Determine the condition of your pastures by completing the Determining Grassland Condition/Trend sheet** (an example of a completed form is provided in Table 2).

What are the estimated yields and seasonal distribution of the existing forages?

Based on the plant species, pasture condition, and soil types found in the pastures, forage yields and overall forage supply can be estimated for your grazing system. **Document the forage yields in lbs./acre on the Livestock Forage Monthly Balance Sheet** (example of completed form is provided in Table 3). Remember these are only estimates to provide a starting point for future planning. Changes in climatic conditions from one year to the next can drastically change forage production and the outcome of seasonal forage supply.

Table 2. Determining Grassland Condition/Trend

	Field #	Rented	Owned			
	Acres	30	55			
	Month & Year	M__Y__	M__Y__	M__Y__	M__Y__	M__Y__
Category	Score	Value	Value	Value	Value	Value
1) Species Composition	Undesirable Desirable 0 1 2 3 4	2	1			
2) Plant Diversity	Narrow Broad 0 1 2 3 4	1	1			
3) Plant Density	Sparse Dense 0 1 2 3 4	2	2			
4) Plant Vigor	Weak Strong 0 1 2 3 4	1	1			
5) Legumes in Stand	Less than 10% More than 40% 0 1 2 3 4	0	0			
6) Plant Residue	Deficient Appropriate Excess 0 2 4 2 0	2	2			
7) Uniformity of Use	Spotty Intermediate Uniform 0 1 2 3 4	3	2			
8) Severity of Use	Heavy Moderate Light 0 2 4 2 0	0	0			
9) Woody Canopy	More than 40% Less than 10% 0 1 2 3 4	4	4			
10) Soil Erosion	Severe Moderate Slight 0 1 2 3 4	2	1			

Once the forage species and yield estimates have been documented, a monthly forage supply can be determined using the estimated forage production and seasonal distribution percentages. For specific forage yields and seasonal distribution using charts from "Pastures for Profit," Natural Resources Conversation Sevice (NRCS) Field Office Technical Guide tables, or information in Appendix D. The estimated monthly values follow the seasonal growth patterns of the common forage species. This exercise provides a good estimate of the total amount of forage available to livestock for any month of the grazing season. Subtract the monthly requirement from the monthly forage production to:

- Indicate forage balance for the growing season
- Predict excess forage production by month
- Predict where forage shortages may occur by month

Using the information in Appendix D, net yield and monthly available forage for orchardgrass in a pasture that is in poor condition can be calculated.

Forage yield estimates for your grazing system can be found in any of the following publications:

- *The County Soil Survey*
- *NRCS Field Office Technical Guide*
- *Pastures for Profit; A Guide to Rotational Grazing, U of MN Extension Service*
- *Refer to Appendix D of this guide for yield estimates*

Example: Monthly available forage for orchardgrass in a pasture that is in poor condition is calculated in the following procedure:

Total Yield

(forage yield) x (acres) = forage production

Example:

(2,500 lbs/acre) x (30 acres) = 75,000 lbs of forage (dry matter basis)

Forage Availability Per Month

(total yield) x (% forage available by month from Appendix D) = monthly available forage

Month	% Forage Available*		Monthly Available forage (lbs./acre)
May	10%	(75,000 lbs. x .10)	7,500
June	30%	x .30	22,500
July	10%	x .10	7,500
August	20%	x .20	15,000
September	20%	x .20	15,000
October	10%	x .10	7,500

* From "Pastures for Profit" and NRCS Field Office Technical Guide

Table 3. Livestock Forage Monthly Balance – Current Forage Summary

Field	Kind of Forage	Forage Yield (lbs./acre)	Acres	Total Yield (lbs./acre)	Forage Availability Per Month (lbs x 1000)					
					May	June	July	Aug	Sept	Oct
Rented	Orchardgrass	2500	30	75,000	7.5	22.5	7.5	15.0	15.0	7.5
Owned	Kentucky Bluegrass	1900	38	72,200	7.2	28.9	7.2	10.8	10.8	7.2
Owned	Reed Canarygrass	2700	17	45,900	9.2	13.8	9.2	4.6	6.9	2.3
Total lbs. Forage Available (x 1000)				**193.1**	**23.9**	**65.2**	**23.9**	**30.4**	**32.7**	**17.0**
Total lbs. Forage Required by Livestock (x 1000)				**225.6**	**36.0**	**36.0**	**38.4**	**38.4**	**38.4**	**38.4**
Total lbs. of Excess or Deficiency (x 1000)				**-32.5**	**-12.1**	**29.2**	**-14.5**	**-8.0**	**-5.7**	**-21.4**

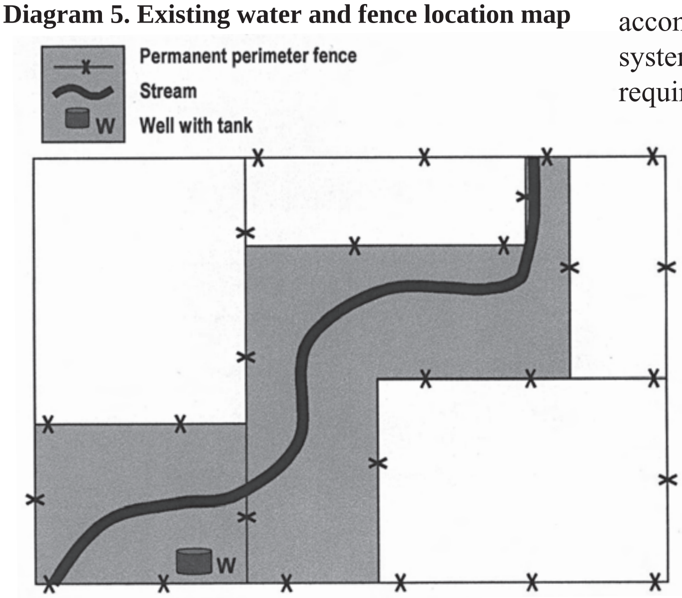
Water Sources

What are the existing water sources and where are the drinking facilities?

Water is essential. Without an adequate supply of quality water, animal health, weight gain, or milk production can be negatively affected. **Locate on a map the water sources and drinking facilities that are currently available to the grazing herd** (Diagram 5). Note all possible sources such as streams, ponds, wells, or springs. By viewing these on a map, we can see how far livestock have to travel to receive water. Consider these questions when making decisions:

- Are there seasonal changes in the water supply? Shallow wells or small streams will often dry up during late summer or during times of drought.
- If water is being hauled to the animals, how much storage is available?
- Is a nearby source of electricity available?
- Will the existing water sources be able to accommodate a pumping system that does not require electricity?

Diagram 5. Existing water and fence location map



What are the other potential water sources?

Changes to the grazing system may require making improvements to your livestock watering system. Are there other potential water sources that could be made available to the pasture? Do you need to drill a new well? Where is the best site for a new well? Is there a water source nearby where water can be obtained by constructing a pipeline system? These additional sources provide you with options when making decisions on improving your water system.

If you are not certain of the water quality, tests should be performed to determine whether the water is satisfactory for consumption by livestock. Good, clean water is especially critical to producers who expect high animal performance – as with milking cows, stockers, and replacement dairy heifers – although benefits are realized for other classes of livestock as well.

Fencing

What are the types and condition of the existing fences?

Know the kind and condition of existing fences. **Map the location of these fences including both perimeter and interior fences** (Diagram 5). Will the condition and location of the existing fence meet the needs of the grazing system? Should you plan to improve or change the location of any of the fences? Do not be locked in on the location of existing fences. Are there other livestock handling facilities available such as corrals, dry lots, barns, or sheds that are part of the pasture or grazing system?

Grazing Plan Development

Paddock Design and Layout

The development of a grazing plan involves the following:

- Determining how many paddocks are required and their size and shape
- Determining the kind of fence and locations
- Determining how water will be provided to the livestock

How many paddocks are needed for a rotational grazing system?

The *minimum* number of paddocks in a system is dependent upon the length of the rest period that is required for the forages. The lengths of the rest periods for grasses and legumes can be found in Table 4. The rest period allows time for the forage plants to regrow, producing forage for the next grazing cycle. The length of the rest period varies throughout the growing season. When preparing your plan, use an average length or longer length of time (25-30 days). Using less than the average length of time will result in a plan with too few paddocks or paddocks that are too large.

Another component used in determining the number of paddocks is the grazing period. The length of the grazing period in each paddock is based upon the desired level of management, availability of labor, performance objective for the livestock, and growth characteristics of forages. Grazing periods longer than 6 days will damage new regrowth. The grazing of new growth diminishes the ability of the forage plants to regrow quickly, resulting in an overall yield reduction for the pasture. A shorter grazing period is associated with livestock operations where livestock performance is essential, such as with milking cows. Longer grazing periods are more typical of beef cow/calf operations, ewe/lamb operations, and maintaining dry cows.

Table 4. Optimal rest period for forage species

Species	Cool Weather	Hot Weather
	(Days)	
Cool Season Grasses	14	35-50
Warm Season Grasses	35-40	21
Legumes	21-28	21-28

The ***minimum*** number of paddocks ***for each herd*** in the pasture system is equal to:

$$\textbf{Paddock Number} = \frac{\textbf{Rest period (days)}}{\textbf{Grazing period (days)}} + 1$$

Guidance on paddock management is provided in the ***Pasture Management*** *section*

The required size of the paddock for average growth conditions is equal to:

$$\text{Paddock Size} = \frac{\text{(daily herd forage requirement)} \times \text{(days in grazing period)}}{\text{(lbs. forage available per acre)}}$$

Daily herd forage requirement	Total weight of the herd times 0.04 utilization rate (refer to the livestock inventory from Table 1).
Grazing period	Length of time animals are in paddock.
Pounds of forage available per acre	Measured height of forage minus minimum stubble height (from Table 5) x pounds of forage per acre per inch of height (from Table 6).

Table 5. Minimum height (in inches) of pasture species for initiating and terminating grazing

	Begin Grazing		End Grazing	
Species	Initial Grazing Height in Early Spring*	Minimum & Optimum Height of Vegetative Growth	Minimum Stubble Height**	Minimum Regrowth before Killing Frost
Alfalfa		Bud Stage	-	6***
Creeping Foxtail	6	8-10	3	6
Green Needlegrass	4-5	6-8	3	5
Inter. Wheatgrass	4-5	8-14	4	6
Kentucky Bluegrass	2	4-6	2	4
Orchardgrass	3-4	6-10	3	6
Perennial Ryegrass	3-4	5-7	3	4****
Pubescent Wheatgrass	4-5	8-14	4	6
Reed Canarygrass	4-5	8-8	4	6
Russian Wildrye	4	5-7	3	4
Slender Wheatgrass	4-5	6-12	3	6
Smooth Brome	4	8-14	4	6
Tall Fescue	4	6-10	3	6
Tall Wheatgrass	4-5	8-14	4	6
Timothy	4	6-10	4	5
Western Wheatgrass	4	6-10	4	5
Big Bluestem		10-14	6	6
Indiangrass		10-14	6	6
Little Bluestem		5-7	3	4
Sand Bluestem		8-14	6	6
Sideoats Grama		5-7	3	4
Switchgrass		12-20	8	10

Source: Minnesota NRCS Conservation Practice Standard #528A, Prescribed Grazing.

* This applies only to the initial grazing in the spring (early May). The livestock must be moved rapidly through the paddocks during this time to prevent overgrazing and to keep the forage from "getting ahead of the livestock."

** Minimum stubble height is critical if stand is to be maintained. This applies to that part of the grazing season after the initial rapid growth period in early May, as well as the end of the grazing season.

*** The last harvest of alfalfa for pasture or hay should generally be made 35-45 days prior to the time when the first hard freeze typically occurs.

**** Regrowth should be grazed to 2 inches after dormancy and prior to snow cover.

How do I decide paddock size?

Paddock size is based upon providing an adequate supply of available forage to meet the requirements of the herd. This would be a simple task if the forages grew at the same rate throughout the season. We know this is not the case. For example, cool season grass growth is very rapid in the spring, slows considerably during the hot summer months of July and August, and increases somewhat again in the fall.

Clearly, for a given herd the area required to produce the necessary forage for the planned grazing period will not be the same throughout the grazing season. The strategy for dealing with this variability is this:

- Plan using average growing conditions.
- Vary the length of the grazing period throughout the grazing season when paddock size is fixed.
- Vary the size of the paddock when the size is not fixed, as in a strip grazing system.

The paddock size times the minimum number of paddocks provides us with the minimum required size of the total pasture unit. If the existing pasture is larger than this minimum area, more paddocks can be planned for. This will likely provide more than enough forage in the spring, some of which could then be harvested for hay. Having more paddocks than the required minimum will reduce the risk of running out of forage during the midsummer slump that cool season pastures normally experience.

If the acreage of the required minimum number of pastures is more than the existing pasture acreage, additional acreage should be devoted to pasture to avoid running out of usable forage during the midsummer slump.

What are some considerations for paddock layout?

Some adjustments need to be made to the size of each paddock so they have equal productivity. The information gathered during the inventory process is useful when determining the paddock layout. Each paddock should have:

- Similar soils (refer to Diagram 2)
- Similar slope aspect (north facing, south facing, etc.)
- Similar topography
- Similar forages (refer to Diagram 4)

The shape of the paddocks is significant. Paddocks should be as square as possible to promote more uniform grazing. Long, narrow paddocks generally are overgrazed at one end and underutilized at the other end. Paddocks should be planned so that livestock do not have to travel more than 800 feet to get water. This will encourage more water consumption by the livestock and more uniform grazing within the paddock. Livestock tend to utilize the forages close to water much more than forages farther from the water. Additional adjustments may be required based upon access to water sources, which may have an impact on the shape of the paddocks in a grazing system, particularly in situations where natural water sources, such as ponds and streams, are utilized.

Paddock layout will also be influenced by the location of lanes for the movement of livestock. These lanes should connect all paddocks so that livestock can be moved to any paddock from the one they currently occupy, allowing for maximum flexibility in forage management.

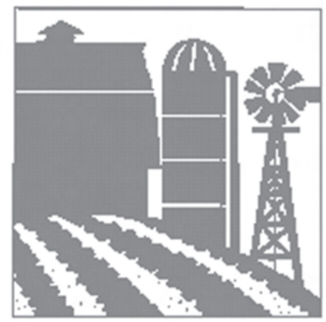


Table 6. Estimated dry matter yield per acre-inch for various forages at three stand densities

Forage	Stand Density[1] Fair*	Good**	Excellent***
	lb. Dry matter/acre-inch		
Bluegrass/White Clover	150-250	300-400	500-600
Tall Fescue+Nitrogen Fert.	150-250	250-350	350-450
Tall Fescue/Legume	100-200	200-300	300-400
Smooth Bromegrass/Legumes	150-250	250-350	350-450
Orchardgrass/Legumes	100-200	200-300	300-400
Mixed Pasture	150-250	250-350	350-450
Alfalfa or Red Clover	150-250	200-250	250-300
Native Tall Warm-Season Grasses	50-100	100-200	200-300

Source: USDA-NRCS (MN)

[1]Stand condition is based on visual estimate of green plant ground cover after being grazed to a 2-4 inch stubble height.

* Fair Condition: Less than 75% ground cover or greater than 25% bare ground.

** Good Condition: 75-90% ground cover or 10-25% bare ground.

*** Excellent Condition: At least 90% ground cover or less than 10% bare ground.

Fence Design and Layout

What kind of fence should I install?

The kind of fence that should be installed depends upon:

- Purpose of the fence
- Kind and class of livestock to be contained
- Operator preference
- Predator control
- Cost

Permanent or temporary fences may define paddocks within the grazing unit. During initial stages of paddock layout many producers prefer to use temporary fences to create paddocks and lanes. This allows for easy adjustment of the layout as producers learn what size paddock they need, how to easily accomplish livestock movement, and how forages react to managed grazing. After gaining experience, the producers usually install some type of permanent fence to define paddocks and lanes.

A. Permanent Fences:

Permanent fences are used for the perimeters of pasture systems, livestock corrals, and handling facilities. Sometimes they are used to subdivide pastures into paddocks. This is especially true for certain kinds and classes of livestock, such as bison.

1. High Tensile Wire Fences

This is a relatively new type of fence, which has become increasingly popular in recent years. Typically perimeter fences are 4-6 strands of wire and interior fences are 1-2 strands of wire.

Advantages:

- Relatively easy to install and maintain.
- Can be powered to provide a psychological as well as physical barrier.
- Several contractors available to do installation.

Disadvantages:

- Requires some special equipment, such as a post driver for installing wooden posts.
- Fences with several strands of wire are not easily moved.
- Wire is difficult to handle if fence is to be moved.

2. Woven Wire Fences

Woven wire is a traditional type of fence. It is used primarily for hogs and sheep. Woven wire fences normally have one or two strands of barbed wire installed above the woven wire.

Advantages:

- Not dependent on electrical power. Is useful in remote locations.
- Provides barrier for smaller kinds of livestock (sheep, hogs).

Disadvantages:

- Cannot be powered, provides only a physical barrier.
- Requires much labor to install.
- Not easily moved.
- Weed and vegetative growth promotes snow piling.

3. Barbed Wire Fences

Barbed wire is a traditional type of fence, which is still quite popular. Barbed wire fences should be at least 4 strands for perimeter fences. When used for interior fences, they are typically 3 or 4 strands. Barbed wire should never be electrified because of greater potential for animal injury.

Advantages:

- Not dependent upon electrical power, thus is useful in remote areas.
- Most producers are experienced with construction of barbed wire fences.

Disadvantages:

- Not easily moved.
- Provides only a physical barrier.
- Susceptible to damage from snow accumulation.

B. Temporary Fences:

The primary uses of temporary fence are to define paddocks within a pasture system, direct the grazing within a paddock to areas that are being underutilized, and to fence in areas that are grazed only occasionally or not part of a regularly-rotated pasture system.

Temporary fences are usually constructed with step-in posts and polywire, polytape, light gauge steel or aluminum wire, and require an electrical source. Easy and quick to move, these fences do not require tools for setup. In addition, these fences are very light and do not require bracing.

Advantages:

- Easy to install and to move.
- Relatively inexpensive.
- Provides considerable flexibility.
- Can be used within permanently established systems to direct grazing pressure.

Disadvantages:

- Components have relatively short lifespan.
- Not suitable for perimeter fences.
- Provides a psychological barrier only, not a good physical barrier.
- Requires an electrical source and maintenance of the fence line from electrical grounding.

Water System Design and Layout

How can I supply adequate water to the livestock?

Water is essential for livestock to effectively process forages. A well-planned and installed water system will provide an adequate quantity of water with minimal disturbance to the soil resource and to the water source itself.

Common sources of water for livestock are streams, ponds, lakes, and wells. Of these sources, well water is preferred because it is cleaner. Research shows that there can be a significant increase in animal performance and improved herd health if the drinking water is clean and free from sediments, nutrients, pesticides, algae, bacteria, and other contaminants.

Alternative methods of delivering the water to the livestock include:

- Ramps to surface water (ponds, etc.)
- Livestock powered pumps
- Solar pumping systems
- Sling pumps
- Hydraulic ram pumps
- Gasoline powered pumps
- Water hauling

These methods can be used to discharge directly into a trough or tank, but normally a pipeline is installed to distribute the water to drinking facilities available in all paddocks. When using a pipeline to deliver water you may need to have a system that is engineered to meet the specific needs of your site. See Appendix E for description of pumping systems.

For technical assistance in designing your watering system, contact your local NRCS Field Office.

Considerations in designing a pipeline system include:

- Quantity of water to be delivered
- Pressure differences due to elevation changes
- Length of pipeline
- Protection from freezing

Where should drinking facilities be located?

Drinking facilities should be available in each paddock. If possible, locate drinking facilities so that livestock do not have to travel excessive distances to drink. In systems where livestock must travel long distances to water, forages tend to be overutilized near the water, and underutilized in areas of the paddock that are farthest from the water. Other problems associated with this situation include uneven manure distribution in the paddock and diminished animal performance.

Most livestock watering systems consist of a pump, a delivery system (usually a pipeline), and a trough or tank for the livestock to drink from. Once the paddock layout is established, and the water sources identified, the delivery system must be accommodated. If water is to be hauled, access by the tanker needs to extend to each storage tank. If the water is to be delivered through a pipeline, the route must be determined so that each paddock in the system has access to the water. The pipeline layout should follow the shortest route to minimize cost and maintenance problems. This will ultimately determine the general area in which the watering tanks will be placed.

Water tanks should be placed on soils that can support heavy traffic and provide easy access by livestock without crowding. Permanently installed tanks should have some type of heavy use treatment around them to prevent the formation of a mudhole. Refer to the following section on **Heavy Use Area Planning**. Portable tanks offer the most flexibility. Their location can be changed frequently by adding a length of pipeline between the coupler and the tank and placing the tank in a different location. The tanks can be moved as often as necessary to manage grazing and avoid creation of barren areas and mudholes.

When using portable tanks, allow for 2 tanks per herd so that one water tank can be set up ahead of time in the next paddock.

See your local NRCS office for design assistance for stream crossings, unstable sites, and drinking facility pads.

Lanes for livestock do not work well for bison. They do not like to be confined to narrow areas. If lanes are used for bison, make them much wider than they would be for other kinds and classes of livestock.

For more information on Geotextiles read "Using All-weather Geotextiles for Lanes and Paths." Midwest Plan Service publication AED-45.

Heavy Use Area Planning

Some areas of the pasture system will be used so much that the best option is to place some type of protective material to prevent the formation of mudholes. Two such areas are those that surround watering facilities and the alleyways used for livestock movement.

What do I consider when planning livestock lanes?

Livestock movement must be controlled for a successful grazing system. Lanes that are properly planned will allow for livestock movement from one paddock to any other paddock without moving back through a recently grazed paddock. Livestock will tend to stop moving when they go into a paddock with some fresh forage growth, even though you may want them in a different paddock. Lanes prevent this from happening. The areas within the lanes can normally be grazed along with an adjacent paddock, unless the lane is covered with some type of protective material. The locations of livestock lanes should avoid potential erosion, concentrated water flow, and flooding. Avoid placing lanes up and down hills, in wetlands, or on organic soils.

How do I stabilize the livestock lanes?

Livestock lanes should be protected with lime screenings or some other fine textured material to prevent mudhole development and erosion when:

- There is considerable animal traffic, as in the case of milk cows using the lane for two round trips each day
- Areas of the lane are subject to erosion

Fine-textured materials are preferred over course-textured materials because the course-textured material can injure the feet of livestock. If animals must traverse lanes that are in unstable areas, such as wet draws, then the treatment described below for protecting watering facilities should be installed to avoid difficulty with livestock movement.

How do I keep the area around water facilities from becoming mudholes?

Watering stations that are permanently placed will be subject to heavy use since they are often used to provide water for more than one paddock. Water spillage and leakage, which is inevitable, adds to the mud problem. As a consequence, protective materials will need to be used around watering sites. Portable watering tanks will not generally have the same problems because they can be moved around to spread the use over a larger area.

The recommended method of building pads for water stations is to:

- Prepare a good subgrade by removing debris and vegetation along with at least 8" of topsoil
- Compact the subgrade
- Lay down a geotextile fabric (Class I)
- Place a six-inch layer of course aggregate on the geotextile fabric and top with a three-inch layer of fine aggregate
- Lanes generally need to be 12-15 feet wide and pads around tanks need to extend out 20-25 feet

Pasture Management

Pasture Forage and Livestock Management

What is proper grazing management for the desired forage species?

To maintain desirable plants for grazing, pasture management must provide adequate rest from grazing in order to give desired species the competitive edge over less desirable plants. A good mix of desired plants within the pasture also benefits the grazing system by providing more ground surface coverage by plants for as many days of the year as possible. Mixtures of grass and legume species that have different growth curves in the same pasture provide greater forage productivity than a single species pasture.

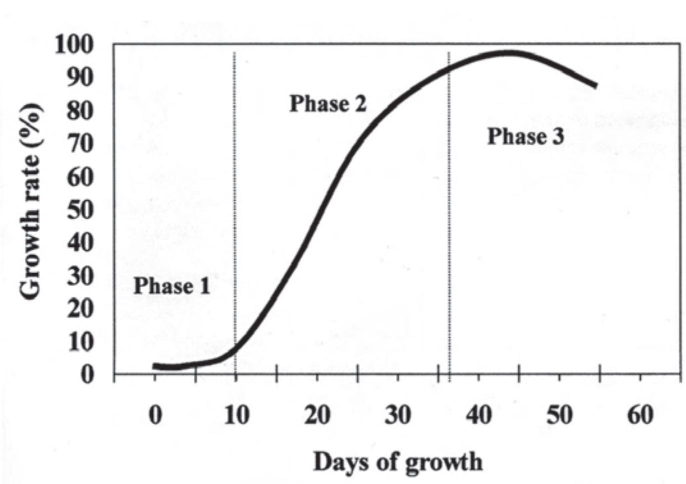
Are the pasture forages adequate to meet the needs of the livestock or are there areas that need improvement? Using the completed **Determining Grassland Condition/Trend** worksheet from the Forage section of Chapter 2, evaluate your pasture. Generally, if the pasture plant population and plant diversity are at a high level but plant vigor is weak, a change in grazing system management to provide a rest period may be all that is needed to increase forage production. In contrast, if plant population is undesirable and plant diversity is low, then establishment of new seedings of desirable plants could add additional forage for the pasture.

The decision to renovate a pasture and establish new forage species or add to the existing forage plants should be well-planned. Should you establish a legume component, grass-legume mixture, or a more productive grass in the pasture? Before purchasing seed, consider economics of the intended management practice, animal preference for forages, soil conditions, and landscape of the site.

How do pasture and livestock management affect plant growth and forage quality?

The basis of forage production is to harvest sunlight and rain to produce healthy forage plants for animals to graze. To be healthy and vigorous, plants need an extensive, healthy root system. There is a direct relationship between root growth and the amount of leaf area developed. If too much of the leaf area is removed, roots will die back. When management limits the removal of forage to no more than 50 - 60%, root growth will not be significantly reduced. Plants will remain healthy and leaf regrowth will be fairly rapid. This growth rate response is illustrated in Figure 1.

Figure 1. The growth rate curve and three phases of pasture growth



The growth curve is divided into three phases. Plant growth is slowest during Phase 1 when plants are small and there is insufficient leaf area to intercept light for growing leaves and to maintain roots. Root growth stops during Phase 1. Grazing during this time will provide high quality but low yielding forage. However, continued grazing during this phase will cause plant vigor to weaken because of reduced root growth. The loss of an extensive root system ultimately results in lower forage yields because the plant's ability to take up water and nutrients are reduced.

Growth rate increases when enough leaves are present to maintain existing leaves and roots and also promote growth of new leaves as occurs in Phase 2. Leaves during this growth phase intercept more sunlight than is needed for maintaining the plant and as a result the rest of the energy is used to rapidly develop new leaves and roots. Grazing during Phase 2 provides the optimum balance of forage yield and quality. The goal is to begin grazing a particular paddock when forage growth is high on the Phase 2 curve and then remove the livestock near the transition from Phase 1 to Phase 2. Nutritional needs of the livestock will determine where on the growth curve to start grazing a paddock. Livestock with a high nutritional requirement, such as milking cows or stockers, should be moved to high quality forage more frequently and will require forage growth that is lower on the Phase 2 curve. Livestock with lower nutritional requirements, such as beef cows, can be kept on a paddock for a longer time and can graze starting high on the Phase 2 curve and end when growth is low in that same phase.

During Phase 3, growth rate slows down as plants mature. Most of the plant's energy is going into seed production or maintenance. Grazing during Phase 3 will provide high yields, but low quality forage will limit performance of most livestock. Only livestock with low nutritional needs such as dry cows or dry ewes will have most of their nutritional requirements met during this growth phase.

When do I start grazing in the spring?

When to allow livestock to start grazing in the spring depends on what you are trying to accomplish. For most grazing operations, managing the early spring growth of forages is the primary consideration in deciding the appropriate time to start the grazing season. Because forage growth of cool-season species can be very rapid in the spring, forage production can easily outpace what livestock are able to consume. As a result, forage quality will decline rapidly in the pasture.

The decision on when to start grazing in the spring is a compromise between maintaining enough growing plant material in the pasture to promote rapid regrowth from healthy plants and keeping forage growth from outpacing the livestock. Because of rapid forage growth, recommended plant heights for initiating grazing in the spring are less than the heights recommended for the rest of the grazing season. Table 5 provides the recommended plant heights for when to initiate grazing in the spring. Grazing forages starting at these heights and for short time periods (no more than 2 days) in a paddock system will provide higher quality feed for later in the season.

Livestock movement during the spring is another important consideration that will affect the balance between maintaining a rapidly growing, healthy pasture and maintaining quality forage for later in the season. Livestock will need to be rotated through the paddocks at a faster pace than typically averaged for the rest of the grazing season. When initiating grazing the forage production is low but dry matter is accumulating rapidly. For livestock to be rotated through all the paddocks before forage growth outpaces consumption, the time spent on an individual paddock will need to be kept short. Clipping or harvesting hay in some paddocks can maintain forage quality if grazing does not keep ahead of the spring growth forage quality.

When do I move livestock from paddock to paddock?

Movement of livestock through paddocks in the early spring is discussed in the previous section. Once forage growth begins to slow (normally in late May) the movement of livestock is based upon the amount of forage available and the minimum stubble heights shown in Table 5.

Grazing should be terminated in a paddock when the livestock have grazed the forage down to the minimum stubble height.

A paddock is not ready to graze until the forage has reached the minimum height shown in Table 5, in the column labeled "Minimum and Optimum Height of Vegetative Growth."

Not every paddock will yield the same quantity of forage due to differences in soil conditions and landscape. Knowing how much forage is produced or available in each paddock is important. The following equations and tables determine how many animals will be needed to utilize the forage in a given period of time, and how much time a given number of animals will be able to graze a paddock.

A. How many animals will a particular paddock support?

The following equation calculates the number of animals a particular paddock will support:

$$\text{Number} = \frac{\text{(pounds of forage/acre) x (\# of acres)}}{\text{(individual animal weight) x (utilization rate) x (days)}}$$

Example:

$$\frac{\text{(1200 pounds/acre yield) x (8 acres)}}{\text{(1200 pounds/animal) x (.04) x (4 day grazing period)}} = \text{50 head}$$

Pounds of forage/acre	Table 6 x inches of usable forage
Number of acres	Acres in a specific paddock
Individual animal weight	From Livestock Inventory
Utilization Rate	0.04 represents forage intake, trampling and buffer
Days	The planned length of grazing period for the paddock

B. How many days can my herd stay on a paddock?

The following equation calculates the number of days a paddock will support a herd:

$$\text{Days} = \frac{\text{(pounds of forage/acre) x (\# of acres)}}{\text{(daily herd forage requirement)}}$$

For paddock management it is important to be able to estimate the quantity of forage on a paddock at a given time. This is especially important just prior to moving livestock into a paddock. Table 6 indicates forage quantity based on forage species, height of growth, and pasture condition.

Example:

$$\frac{\text{(1200 lbs/acre yield) (8 acres)}}{\text{(42,000 lbs) (0.04 utilization rate)}} = \text{5.7 days}$$

Pounds of forage/acre	Table 6 x inches of usable forage
Number of acres	Acres in a specific paddock
Daily herd forage requirement	Total herd weight x 0.04 utilization

There should be some residual stubble left in the paddock. The height of the stubble recommended for common grass species is given in Table 5. Subtract the required stubble height from the total forage height when computing pounds of forage available.

Growing conditions can change dramatically through the season, which will affect plant growth. For this reason, management must be flexible and not follow a set rotation pattern when moving animals. Movement of livestock from one paddock to another should be based on the height and the availability of forage. Grass and legume mixtures should be grazed in a manner that favors the dominant or desired species. The equations and tables referred to in this section provide estimates of available forage and how long livestock can graze an area. These are only estimates for planning. Actual decisions should be based on routine pasture observations. A successful rotational grazing system requires continuous monitoring and adjustment to balance the needs of both the plants and livestock.

Pasture Soil Fertility Management

Proper fertilization of pastures allows for good stand establishment, promotes early growth, increases yield and quality, and improves winter hardiness and persistence. Adequate fertility also improves the ability of grass and legume to compete with weeds, and increases resistance to insects and diseases. Fields differ in their fertilizer needs. Take soil samples from representative areas to determine fertilization and liming requirements when converting to a rotational grazing system. Soil testing is the easiest and least expensive way to evaluate soil fertility and accurately assess if fertilizer is needed.

Can nutrients from livestock manure be utilized more efficiently in pastures?

Nutrients are primarily removed from pasture ecosystems by making hay. Animals also remove nutrients through grazing. When pastures are grazed, many of the nutrients are returned to pastures via urine and feces. About 60-80% of the nitrogen, 60-85% of the phosphorus, and 80-90% of the potassium are excreted in urine and feces. Manure also contains many micronutrients needed by pasture plants. If manure is evenly distributed throughout the paddocks, fertility can almost be maintained through natural nutrient recycling.

Often, a majority of the urine and feces is concentrated around water, shade, and other areas where livestock congregate. This concentration of manure can lead to nutrient deficiencies in other parts of the pasture. Not only does concentration of manure around water and shade sites lead to lower pasture productivity, it also leads to greater opportunity for nitrate contamination of surface and ground water.

To evenly distribute manure and increase soil fertility throughout the paddock, shorten the rotation, increase stocking rates, and place water, shade, salt, and supplemental feeders in nutrient-poor areas. Minimize the amount of time animals spend around water by assuring the cattle do not have to travel more than 600 to 800 feet in each paddock.

For more detailed information on soil test recommendations, contact your local Extension office or USDA Agricultural Service Center.

If additional fertilizer is needed, the applicator should avoid spreading materials within 100 feet of permanent watering or shade sites because manure is often concentrated in these areas.

When is increasing soil pH with lime important for forage production?

Overall, soil microorganism activity and plant nutrient availability are nearly optimum at a soil pH of 6.5 to 7.0. Lime applications should be made to increase soil pH to a level appropriate for the crop being grown. It is often best to grow species that are adapted to your soil pH (Table 7). Grass species are more tolerant of lower pH, whereas legumes need a more neutral pH. If the pasture planning strategy is to increase or introduce legumes into the pasture, correcting to the recommended soil pH is a must. Apply lime to the pasture following soil test recommendations. Surface applied lime will react slowly, so it should be applied 12 months before seeding.

Table 7. pH recommendations for different forage crops

Species	Optimum pH
Alfalfa	6.5 - 7.0
Smooth Bromegrass	6.0 - 7.0
Red Clover	6.0 - 7.0
Tall Fescue	5.6 - 7.0
Timothy	5.6 - 7.0
Switchgrass	5.6 - 6.5
Orchardgrass	5.6 - 6.5
Birdsfoot Trefoil	5.6 - 7.0

Table 8. Nitrogen recommendations for various pasture management situations

Expected Yield	Nitrogen Rate
tons dry matter/acre	lbs./acre
2	60
3	90
4	120
4+	150

Source: Fertilizer Recommendations for Agronomic Crops in Minnesota, University of Minnesota Extension Service, BU-06240-S, 2001

How much nitrogen fertilizer do I need to put on my pasture?

Nitrogen (N) is often the most limiting nutrient in the production of grass for pasture or hay. Grazing animals normally return 60-80% of available nitrogen back to the pasture. Additional N fertilization may be needed depending on your yield goals (Table 8). Nitrogen will not only improve dry matter yield, it will lead to increased plant crude protein content and dry matter digestibility if plants are grazed before they get too mature.

Since legumes can fix their own nitrogen from the atmosphere, pastures with more than 30% legumes rarely need additional N fertilizer. It is often reported that 80-100 lb. N/acre produced by the legumes is gradually available to the associated grass plants.

Does phosphorus and potassium fertilizer improve pasture productivity?

Grasses may respond to phosphorus (P) and potassium (K) when nutrients limit plant growth. Phosphorus and potassium levels can increase seedling success by encouraging root growth. However, response to applied P and K is not usually profitable unless nitrogen supplies are adequate.

Legume-grass pastures have a higher requirement for P and K than do grass pastures. These two nutrients not only increase legume yields but also enhance disease resistance, winter hardiness, and stand life. Timing of application of P and K on legume-grass pastures is not critical; however, early spring or August applications are favored.

Applications can be made each year or you can double the rates and apply every other year. Tables 9 and 10 list the P and K recommendations based on soil test results.

Pasture Brush and Weed Control

Weeds compete with desirable plants for water, nutrients and light. They can reduce yields of desirable species and can cause problems with animal health, animal weight, and/or milk production. Effective weed management begins with proper establishment of forage species that are adapted to soil, climate, and intended uses. Under these conditions, weeds can often be managed through appropriate grazing management and proper maintenance of soil fertility.

Broadleaf weeds tend to be the most troubling in perennial grass pastures. Many broadleaf weeds are on the noxious weed list and several are poisonous to livestock. These broadleaf weeds are generally less palatable, less nutritious, lower yielding and are less dependable as a forage supply for livestock. Weeds with known palatability problems include: musk, plumeless and bull thistle, nettles, absinth wormwood, perennial sowthistle, swamp smartweed, and common mullein.

Can unwanted weeds be controlled through grazing?

Many weeds are unpalatable when mature but readily grazed when immature. Therefore, grazing practices can greatly influence whether weeds are routinely grazed or selectively passed over. Continuously grazing a pasture with low stocking density frequently leads to selective grazing. This can lead to increased weed and brush problems. Continuous grazing at high stocking rates will often weaken desirable species. This can lead to rapid weed invasion.

Producers who have successfully implemented rotational grazing management often find that their pasture weed problems begin to diminish within the first few years of grazing. This is primarily because of the improved vigor and

Table 9. Phosphate fertilizer reecommendations for grasses and grass-legumes grown for hay and pasture

Expected Yield	Phosphorus (P) Soil Test (ppm)				
Bray:	0—5	6—10	11—15	16—20	21 +
Olsen:	0 - 3	4—7	8 - 11	12—15	16 +
ton/acre	P_2O_5 to apply (lbs./acre)				
Grasses					
2	40	30	20	10	0
3	50	40	30	20	0
4	60	50	40	30	0
4+	70	60	50	40	0
Grass-legumes					
2	35	25	15	0	0
3	55	40	25	10	0
4	70	50	30	10	0
5	90	65	40	15	0

Source:Fertilizer Recommendations for Agronomic Crops in Minnesota, University of Minnesota Extension Service, BU-06240-S, 2001

Table 10. Potash fertilizer recommendations for grasses and grass-legumes grown for hay and pasture

Expected Yield	Potassium (K) Soil Test (ppm)				
	0—40	41—80	81—120	121—160	161 +
ton/acre	K_2O to apply (lbs./acre)				
Grasses					
2	90	60	30	0	0
3	100	70	40	10	0
4	110	80	50	20	0
4+	120	90	60	30	0
Grass-legumes					
2	95	65	40	15	0
3	140	100	60	20	0
4	185	135	80	25	0
5	230	165	100	35	0

Source:Fertilizer Recommendations for Agronomic Crops in Minnesota, University of Minnesota Extension Service, BU-06240-S, 2001

Noxious weeds must be controlled according to Minnesota State law (primary noxious weeds) and county law (secondary noxious weeds). Listed are the primary noxious weeds in Minnesota; other states may have different lists.

Perennials	*Biennials*	*Annuals*
Poison ivy	*Bull thistle*	*Hemp*
Leafy spurge	*Musk thistle*	
Field bindweed	*Plumeless thistle*	
Perennial sowthistle		
Canada thistle		
Purple loosestrife		

competitiveness of desirable species and regular grazing of weeds in their more palatable, immature growth stage.

Grazing management alone, however, will not normally correct serious preexisting weed problems without great losses in animal performance. Thistles, brush, and poisonous plants may continue to be a problem even after you have intensified your grazing system. This is because even at high stocking rates cattle seldom eat these weeds.

Sheep or goats can offer an alternative weed control method. They often will consume plants that other animals avoid. As a result, there are opportunities for sheep and goats to be used as an environmentally friendly and cost effective way to control weeds. This method of control is especially practical when the weeds are located in areas where other control means are impractical.

What are the cultural and mechanical brush and weed control alternatives for pastures?

A. Cultural Control:

Several cultural practices help maintain a weed-free pasture. Weeds are generally more of a problem in overgrazed pastures than in fertile, well-managed pastures. Good grazing management (which includes pasture rest periods) and good fertility will go a long way in keeping the desirable forage species healthy and able to compete with pasture weeds. To prevent the spread of weeds, avoid spreading manure contaminated with weed seeds, clean equipment after working in weed-infested pastures, and keep fence rows free of problem weeds.

B. Mechanical Control:

Mechanical weed management involves the physical removal of all or part of the weeds and brush. Repeated mowing, clipping and hand weeding can diminish weed infestations. When in the bud to early bloom stage, cut weeds 3 to 4 inches above the soil. Mechanical weed control is more successful when coupled with good fertilization and grazing management.

Biennial and perennial weeds tend to be the most troublesome in established pastures. Biennials, such as musk and plumeless thistle, reproduce only by seed. They require a two-year period to produce seed. Clip annual and biennial weeds to prevent seed production.

Perennial weeds, such as Canada thistle and absinth wormwood, reproduce by seed, but also spread by vegetative parts such as underground roots or rhizomes. Clip perennial broadleaf weeds at the bud to flowering stages to maximize depletion of root carbohydrates. Repeated clipping of perennial broadleaf weeds with upright growth habits at 4-week intervals will eventually kill an infestation over a 2 to 3 year period, but may not be practical. Many perennials that persist in hay fields are adapted to the cutting schedules and growth habit of forages such as alfalfa. Other than hemp, annual weeds should not persist beyond the establishment year, unless soil disturbance such as overgrazing exposes soil.

Other options include tillage and burning. Tillage can be used to suppress weeds as part of a pasture renovation program, but is seldom used to manage weeds in a good pasture. Periodic burning may be a beneficial weed suppression tool and can be used in combination with mowing on woody plant species. Burning should be used as the first treatment and mowing used for the subsequent years.

When is control of brush and problem weeds with herbicides the best option?

Even with the best cultural and mechanical methods of control, serious weed problems may need to be controlled with herbicides. The use of herbicides is justified when used with proper grazing management and where herbicide use results in desirable economic returns. Frequently, weeds are patchy, making spot spraying the preferred method of control. Spot spraying is less costly than broadcast applications. Correct identification of problem weeds is critical for successful control with herbicides. Consideration should be given to impacts on surface and groundwater, plant communities and wildlife habitat before herbicides are used. Always read and follow labels when selecting and using herbicides.

A variety of herbicide options exist for broadleaf weed control in grass pastures. No herbicides are labeled to selectively remove broadleaf weeds from legume-grass pastures without severe legume injury. Likewise, no herbicides are labeled to selectively remove unwanted grasses from cool-season grass pastures.

To control biennials such as musk thistle in pastures, apply herbicides in the spring or fall to the rosettes. This results in better control than herbicides applied after the flower stalk elongates. Perennial weeds are typically best controlled with herbicides after the early bud to flowering stage of growth. Fall herbicide applications usually provide the best control of biennial or perennial weeds. Fall applications of herbicide also control any seedlings that may have emerged. In established hay, most herbicides are applied to dormant forages or between cuttings to avoid excessive injury.

Sacrificial Paddock Management

How will the livestock be managed during times of drought or wet conditions?

At some point in time, very wet weather or very dry weather will dominate a significant part of the growing season. Long periods of wet weather can be detrimental if the soil is so wet that livestock traffic causes damage to the roots and growth buds of the forages. Livestock traffic on wet soils can also destroy soil structure, cause compaction, reduce the ability of the soil to absorb rainfall, and reduce the exchange of air between the soil and the atmosphere. Livestock travel in wet lanes can cause the lanes to become muddy, rutted, and easily eroded.

Extended dry weather will reduce the ability of the forage to produce new growth, reducing pasture yield. Paddocks may not have an adequate rest period to replenish the forage to a point where livestock can be allowed to graze them. The tendency of producers is to allow the livestock to continue the rotations, leading to an overgrazed situation. This will have a detrimental effect on forage production in the future.

In both situations (very wet or very dry) it is best to remove livestock from the pasture into a feedlot. Grazing can resume when forage and soil conditions permit.

Another method is to retain the livestock in one paddock or a portion of one paddock and provide some type of emergency feed, such as hay, until weather conditions improve. This is referred to as a sacrificial paddock. It is better to have a serious negative impact on a small area of the pasture system than to continue moving livestock through the paddocks, grazing the forages below the minimum stubble heights which will cause long-term yield reduction.

The area used as a sacrificial paddock should be one where the soils have good resistance to traffic, erosion potential is slight, there is easy access to provide feed, and rejuvenation is relatively easy.

Will sacrificial paddocks be rejuvenated after removal of livestock?

When livestock are placed back into a regular rotation, the sacrificial paddock will likely be in poor condition. The vegetation will most likely be gone or in very poor condition and the area may be in a rough and rutted condition. There are two options to consider:

1. The sacrificial paddock can be left to regenerate on its own. This may be successful if the livestock did not cause significant damage to the soil. The forages that were on the site prior to its use as a sacrificial paddock may resume growth after an extended rest period. The primary risk involved is that undesirable vegetation, such as weeds, will become the predominant vegetation on the site.

2. Another option is to prepare the site with tillage equipment and reseed it to desirable forage species. This may be the best option if the sacrificial paddock has been in use for a relatively long period of time.

See University of Minnesota bulletin AG-BU-3157, Cultural and Chemical Weed Control in Field Crops

Grazing System Monitoring

Pasture Record Keeping

How do I know I have enough forage available?

There are various ways to determine available forage. One of the most useful is the Reserve Herd Days (RHD) concept. This method is a powerful tool because it is quick, easy, sufficiently accurate, and provides meaningful information to producers. The term Reserve Herd Days expresses the number of days of grazing remaining when considering the amount of forage currently on hand in the pasture system. Using this concept will provide the following:

- A determination of how much forage is on hand at the present time, expressed as a number of days of grazing currently available for your herd.
- A determination of where the forage is (which paddocks).
- A measurement of the ebb and flow of forage available over time.
- An indication of pasture condition and the trend in the condition.
- A guide to decision making when excesses and shortages of forages are apparent.

There are two commonly used methods of making RHD determinations, visual and calculated.

A. Visual Method:

This method requires a producer to go into the pasture and make an estimate of the number of days the herd will be able to graze each paddock. This estimate is based upon a visual determination of the quantity of forage available and how many days it will take the herd to graze the forage to the allowable stubble height.

The information is recorded so that comparisons can be made from week to week and from year to year. A blank form is available in Appendix F.

B. Calculated Method:

This method is a little more involved than the visual method, but it provides a more accurate estimate. The small amount of extra time required is worth the benefit of having more information on hand with which to make comparisons.

The following information is required to determine RHD with this method:

- The acres within each paddock.
- The estimated pounds of dry matter per inch of height per acre for the forages within each paddock. This information is available from Table 6.
- The estimated pounds of dry matter the herd will utilize per day. This is simply the total weight of the herd multiplied by the utilization rate (0.04).

A blank form is available in Appendix G. Completion of this form requires going into each paddock, measuring the height of the forage, and placing the information in the correct spot on the form. The inches of forage available is the amount of the forage above the minimum stubble height.

The total pounds of available forage divided by the pounds of forage required each day by the herd (Daily Allocation) equals the Reserve Herd Days. If this number is small you may run out of forage soon. If the RHD is large there may be adequate forage available to harvest some as hay. Other options exist, but consideration must be made for the period of the grazing season when the determination is made, the current weather conditions, and possible changes in the size or makeup of the herd, as well as your management objectives. Having this information recorded is important for making comparisons throughout the grazing season, as well as from season to season.

Is the productivity of the pasture increasing?

Forages that are in good condition will produce more feed than forages that are in poor condition. The worksheet **Determining Grassland Condition/Trend** (Appendix C) is a useful tool for assessing changes in the condition of the overall pasture. Condition of the forages is a significant factor considered in the completion of the form. An initial determination followed by annual monitoring will provide insight into the overall productivity changes. This evaluation should be done in the same area of the pasture and at the same time of the year each time to make the results meaningful.

Clipping and weighing pasture areas each year at the same location and same time of the year will provide useful information to determine the trend of productivity for a pasture. Instructions for this procedure are found in "Pastures for Profit" (see References section).

Another method of determining if the productivity is increasing is to weigh livestock at the beginning and end of each grazing season. This assumes that livestock will produce more if offered more forage to consume. This system of monitoring should be used with caution, since many variables can affect the end of season weights, such as parasite infection in the livestock, genetic changes in the herd, calving dates, or even the weather conditions.

Records should be kept to document the number of animal grazing days on each paddock. This provides information regarding how many head of livestock can be supported by a pasture system. The records are basically a record of: a.) day the animals were turned into a paddock, b.) day they were removed, c.) number of animals and their weight, d.) kind and class of livestock, e.) height of the forage when grazing was initiated and f.) height of the forage when the grazing was terminated.

Are the natural resources improving?

The condition of the soil, forages, watercourses, and bird populations within a pasture system provides insight into the effectiveness of the grazing management. Actions that benefit these resources will likely have a positive effect on the production of forages.

It is important to record the results of tests or observations made so that meaningful comparisons can be made over time.

A. Soils:

Soils are in good condition when they allow easy infiltration of rainfall, allow easy exchange of air with the atmosphere, and support a wide range of life-forms (bacteria, fungi, earthworms, etc.). In addition, organic matter content is a good indicator of the health of the soil.

B. Watercourses:

Well-managed grazing will lead to improvements to watercourses within the pasture system. Features such as erosion in the bottoms and sides of channels should be noted, as well as the condition of the existing vegetation. Monitoring the condition of the watercourses in future years will indicate changes needed in the management of the grazing system.

C. Forages:

Refer to the form **Determining Grassland Condition/Trend**, discussed earlier (Appendix C). This form is very good for monitoring forage condition. This considers such aspects as the species composition of the pasture (desirable vs. undesirable), plant density, and plant vigor.

D. Bird Populations:

Birds are excellent "barometers" of the environmental condition of your pastures and your farm. Their populations react quickly to changes in conditions that affect their food sources and nesting habitat. In general, the more diverse the species and the higher the counts within each species, the healthier the environment on your farm. Select points within the pasture to use to do periodic bird counts, and then plan to do bird counts three times per year at each site.

Grazing Plan Example

This section presents an example of a grazing plan. It represents a starting point for a rotational grazing system. Seven elements of the plan are illustrated:

- Sensitive Areas
- Livestock Summary
- Fencing System
- Livestock Watering System
- Heavy Use Area Protection
- Forages
- Grazing System Management

This plan is based upon the information gathered in the inventory phase of plan development.

Sensitive Areas

The following sensitive areas are identified in this grazing unit (Diagram 6):

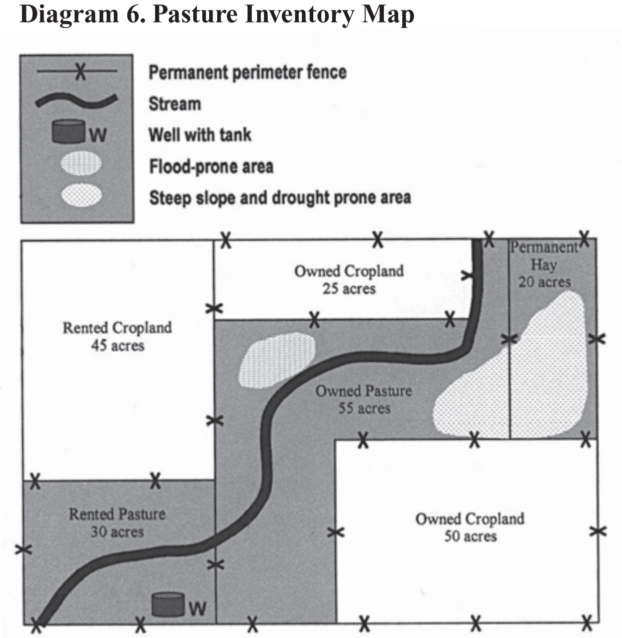
a.) The stream flowing through the pasture is a sensitive area because uncontrolled access to this area by the livestock will cause streambank erosion as well as degrade water quality. Manage these resources by breaking the pasture into smaller paddocks and reducing the amount of time the livestock have access to any segment of the stream.

Currently the streambanks are in poor condition in some locations. This is due to the livestock traveling to the stream to get water. Reduce the impact of the herd on the stream by subdividing the pasture, rotating the grazing, and providing alternative drinking facilities for the livestock. With the planned subdivision of the pasture, the livestock will have access to the stream from only three paddocks.

b.) The flood-prone area can easily be damaged by livestock traffic during periods of wet weather or shortly after flooded conditions. Proper monitoring of the grazing system will avoid damage to this area.

c.) The steep slope (Diagram 6), which is also drought prone, is a sensitive area because it is easily damaged by over-utilization and livestock traffic. This area can be managed closely by subdividing the pasture into paddocks, rotating the grazing, and monitoring the condition of the forage and soil to prevent damage.

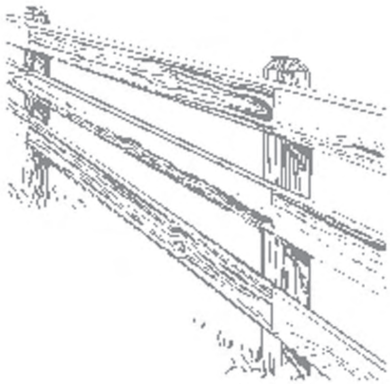
Diagram 6. Pasture Inventory Map



Livestock Summary

Currently there are 25 cow/calf pairs using the pasture. This plan considers increasing the size of the herd to 35 cow/calf pairs. The average weight of the cows is 1200 pounds. These animals are currently managed as one herd. In addition, a herd bull with an average weight of 2000 pounds, will be used.

Monthly and season-long forage requirements are estimated on the **Livestock Forage Monthly Balance Sheet** (Table 11). This indicates that there will be a surplus of forage on a season-long basis. The monthly balance indicates that there will be adequate to surplus quantities of forage through July, and a very small shortage of forage in August. A rather large deficiency occurs during the months of September and



October. The forage balance indicates that some of the pasture may be harvested for hay in the spring, and this will be done when weather conditions appear to be favorable to forage regrowth. This will provide feed for the months of September and October. Refer to the **Grazing System Management** portion of this plan for information related to grass management and sacrificial paddocks to be used during this time period.

Fencing System

Perimeter fences are already in place and are in adequate condition. Interior fences will be constructed to subdivide the pasture into paddocks using 1 or 2 strands of high tensile wire. Locations of the fences are shown on the Grazing Plan Map (Diagram 7).

The installation of the interior fences will break the pasture unit into ten paddocks, ranging from 7-10 acres each. Approximately 13,000 feet of interior fence is required for this system. During periods of average growth, each paddock will be capable of approximately 2-4 days of grazing. In addition to subdividing the pasture, lanes will be constructed. The lanes will allow movement of the livestock from a paddock to any other without passing through a recently grazed paddock.

Table 11. Livestock Forage Monthly Balance Sheet – Current Forage Summary

Field	Kind of Forage	Forage Yield (lbs/acre)	Acres	Total Yield (lbs)	Forage Availability Per Month (lbs x 1000)					
					May	June	July	Aug	Sept	Oct
Rented	Red Clover/ Orchardgrass	4,500	30	135,000	33.8	54.0	27.0	13.5	6.8	0.0
Owned	Red Clover/ K. Bluegrass	3,500	38	133,000	33.3	53.2	26.6	13.3	6.7	0.0
Owned	Reed Canarygrass	3,500	17	59,500	11.9	17.9	14.9	6.0	6.0	3.0
Owned	S. Bromegrass/Alfalfa	4,500	20	49,500	for hay	for hay	31.5	18.0	0.0	0.0
Total lbs. Forage Available (x 1000)				377,000	79.0	125.1	100.0	50.8	19.5	3.0
Total lbs. Forage Required by Livestock (x 1000)				312,000	50.4	50.4	52.8	52.8	52.8	52.8
Total lbs. Forage Excess or Deficiency (x 1000)				65,000	28.6	74.7	47.2	-2.0	-33.3	-49.8

Table 12. Livestock Forage Monthly Balance Sheet – Current Livestock Summary

Kind/Class Livestock	Number of Animals	Average Weight	Monthly Utilization	Forage Requirements Per Month (lbs x 1000)					
				May	June	July	Aug	Sept	Oct
Beef cow/calf	35	1200	1.2	50.4	50.4	50.4	50.4	50.4	50.4
Herd bull	1	2000	1.2			2.4	2.4	2.4	2.4
Totals	36			50.4	50.4	52.8	52.8	52.8	52.8

*0.04 daily utilization rate (includes forage waste) x 30 days/month.

Livestock Watering System

Water will be delivered from the well through a high-density plastic hose system laid on top of the ground (Diagram 8). Portable tanks will be used as drinking facilities. They will be moved with the herd as they graze through the pasture system. Approximately 6,400 feet of pipeline is required, along with two portable tanks. Refer to Diagram 8 for locations of the water pipelines.

The pipelines and tanks do not require frost protection, since they will be drained every fall prior to freezing. The stream will provide water for the livestock in the event that the well of pipline should fail.

Heavy use Area Protection

Where the lanes cross the stream, the stream banks and channel will be shaped and stream crossings will be installed using heavy use area protection measures. Because the water tanks are portable they do not require heavy use area protection.

Forages

The existing forages in these pastures are:

Paddocks 7, 8, 9, 10:
Orchardgrass
Paddocks 5, 6:
Reed Canarygrass
Paddocks 1, 2, 3, 4:
Kentucky Bluegrass

The current condition of the forages is poor. To improve the pastures all paddocks, except for the area of reed canarygrass, will be frost seeded with clover to provide nitrogen for increased yield and to improve the nutritional value of the forage mix.

To provide better quality and quantity of forages during the midsummer slump that cool season grasses go through, the alfalfa/bromegrass hay field will be utilized after one crop of hay has been harvested.

Yields are estimated on Table 11. These are only esti mates based upon expected yields with the planned improvements in place. Actual yields should be determined when the rotational grazing system is in place. The grazing system will require monitoring to maximize forage utilization without overgrazing.

Diagram 7. Fence Location Map

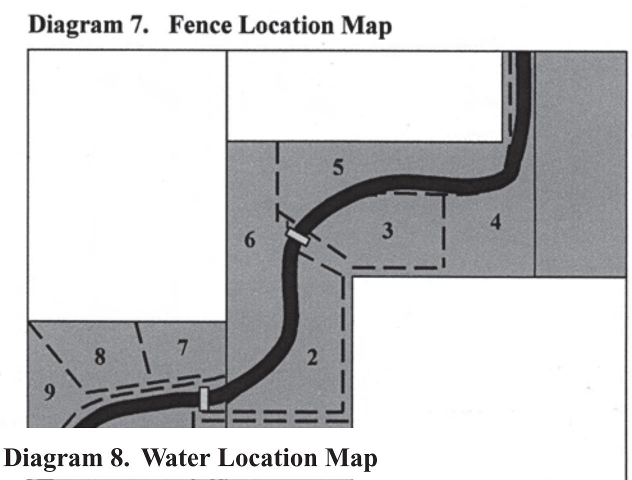
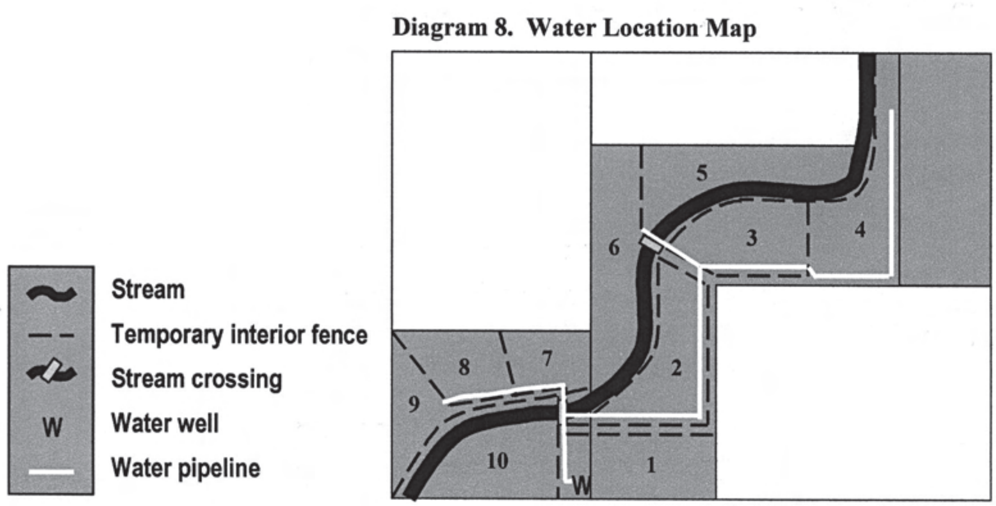


Diagram 8. Water Location Map



Grazing System Management

The key to maintaining vigorous vegetation is to avoid overgrazing. The forage plants will recover from grazing without depleting root reserves only if there is adequate leaf area remaining to meet the food requirements of the plant.

Initiate grazing in early spring when the orchardgrass is 3-4 inches tall, reed canarygrass is 4-5 inches tall, and the grass in the Kentucky bluegrass paddocks is 2 inches high. Because the grass growth in the spring is rapid, the livestock should be moved through the system from paddock to paddock at a fairly rapid pace, every 1-2 days if possible. As the grass growth slows later in the growing season, slow the rotation through the paddocks to an approximate interval of 4-6 days, basing movement of the livestock on:

- The minimum stubble heights of the forages:
  - 2 inches for Kentucky bluegrass
  - 3 inches for orchardgrass
  - 4 inches for reed canarygrass
- The minimum required regrowth:
  - 4 inches for Kentucky bluegrass
  - 6 inches for orchardgrass
  - 8 inches for reed canarygrass

The number of actual grazing days will vary with the size of the paddock, and in practice it will vary with the condition of the forage, how much grazing pressure has been applied in the past, weather conditions, and time during the grazing season.

The hay field will be used for grazing during the summer after a crop of hay has been harvested and regrowth is sufficient. This will provide high quality forage for mid- to late summer, and will allow an extended rest period for the other paddocks at a time of the season when they need it (35-50 days). The hay field will be subdivided by temporary fence into 3 paddocks to allow better management of the forages.

The balance of forage available and forage required indicates that there will be significant periods of time during September and October when the livestock will need to be placed into a sacrificial paddock in late summer and early fall and fed hay because there will not be adequate forages for grazing in the pastures. Plan on having hay on hand for this from the harvest of excess available in June and July.

Paddock 1 will be used as the sacrificial paddock when necessary. This paddock is less erodible than the others and does not contain sensitive areas. This paddock is easily accessible for emergency feeding.

During very wet weather, livestock traffic may cause excessive damage to the soil or the forage. If this occurs, move the livestock from paddock to paddock more rapidly, or confine the animals to the feedlot (or use a sacrificial paddock) and provide them with emergency feed. When conditions improve, put the livestock back into a regular rotation.

During very dry weather, the forage growth will slow considerably. The livestock should be moved at a slower pace through the paddocks. If minimum stubble height cannot be maintained, confine the livestock to a portion of one of the paddocks (a sacrificial paddock) and provide them with emergency feed until they can be put back into a regular rotation. Do not use any of the sensitive areas as sacrificial paddocks.

Regrowth of the forage prior to fall freeze-up is important for maintaining health and vigor of the plants through the winter. Prior to a killing frost, the forage should have 6 inches of regrowth on the reed canarygrass and orchardgrass, and 4 inches on Kentucky bluegrass. Since these heights are not possible to attain on all paddocks, manage one third of the paddocks so that they get the required regrowth each year, and then alternate this treatment from one year to the next. This regrowth can be grazed to the minimum stubble heights as stockpiled forage after the forages go dormant, about mid-October.

Fertilization of the pastures will be done to ensure optimum yields. Fertilizer applications will be based on soil tests and economic analysis. The pH of the soil will be maintained between 6.0 to 7.0.

Overwintering will not be done on this pasture system. Each paddock will be clipped as the livestock are rotated out if needed to control weeds.

"Grazing Management, Pasture

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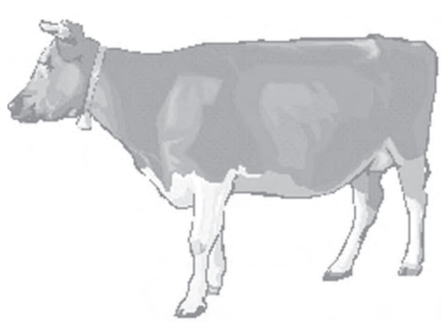


Appendix A. Livestock Forage Monthly Balance Sheet

Producer: ______________________ **Location:** ______________________ **Date:** _____________

LIVESTOCK SUMMARY

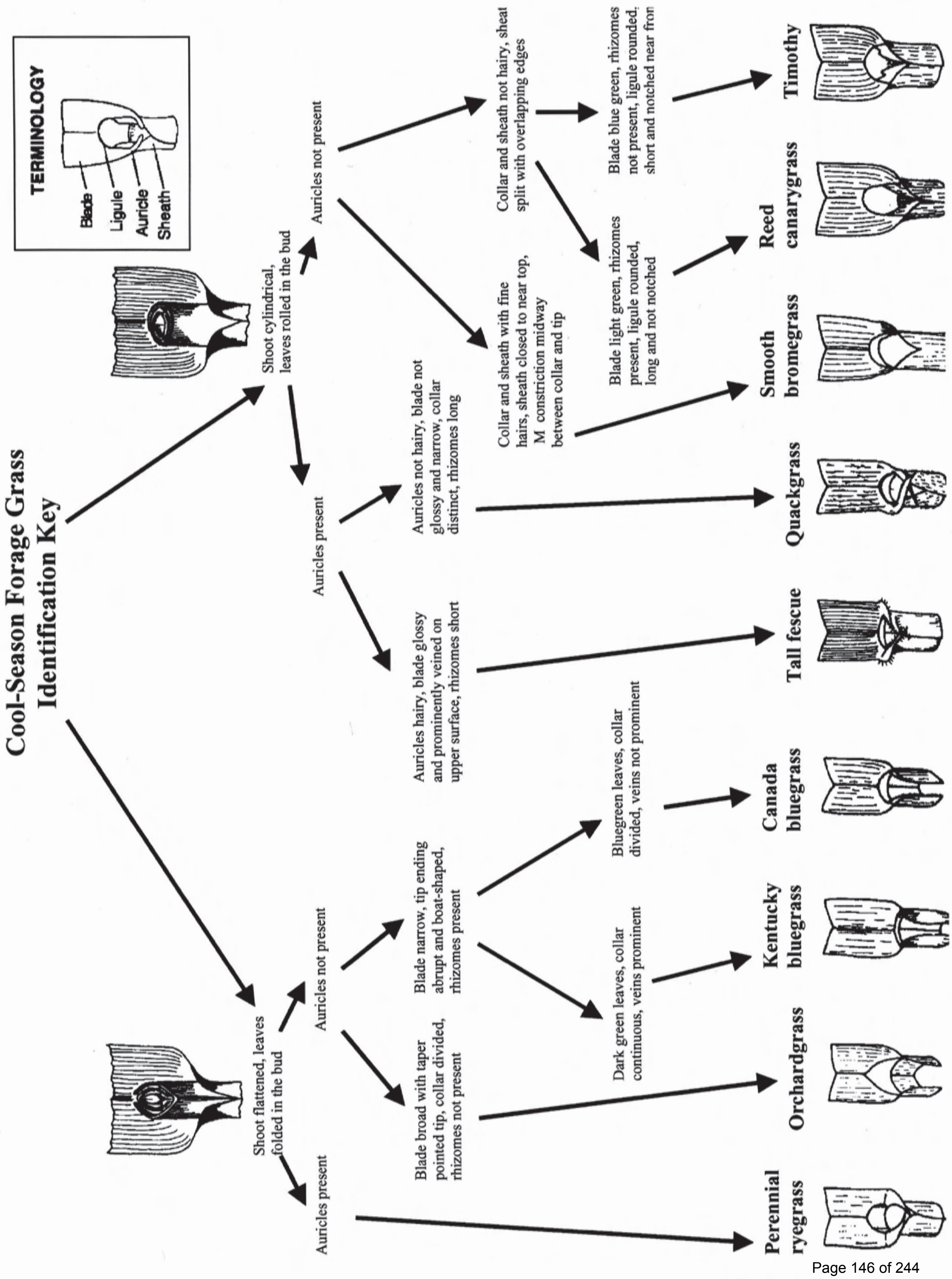
				Forage Requirements Per Month (lbs. x 1000)						
Kind/Class Livestock	Number of Animals	Average Weight		Apr	May	June	July	Aug	Sept	Oct
			1.2*							
			1.2*							
			1.2*							
			1.2*							
			1.2*							
			1.2*							
Totals										

*0.04 Daily utilization rate (2.5% intake, 0.5% trampling loss, and 1% buffer) x 30 days/month

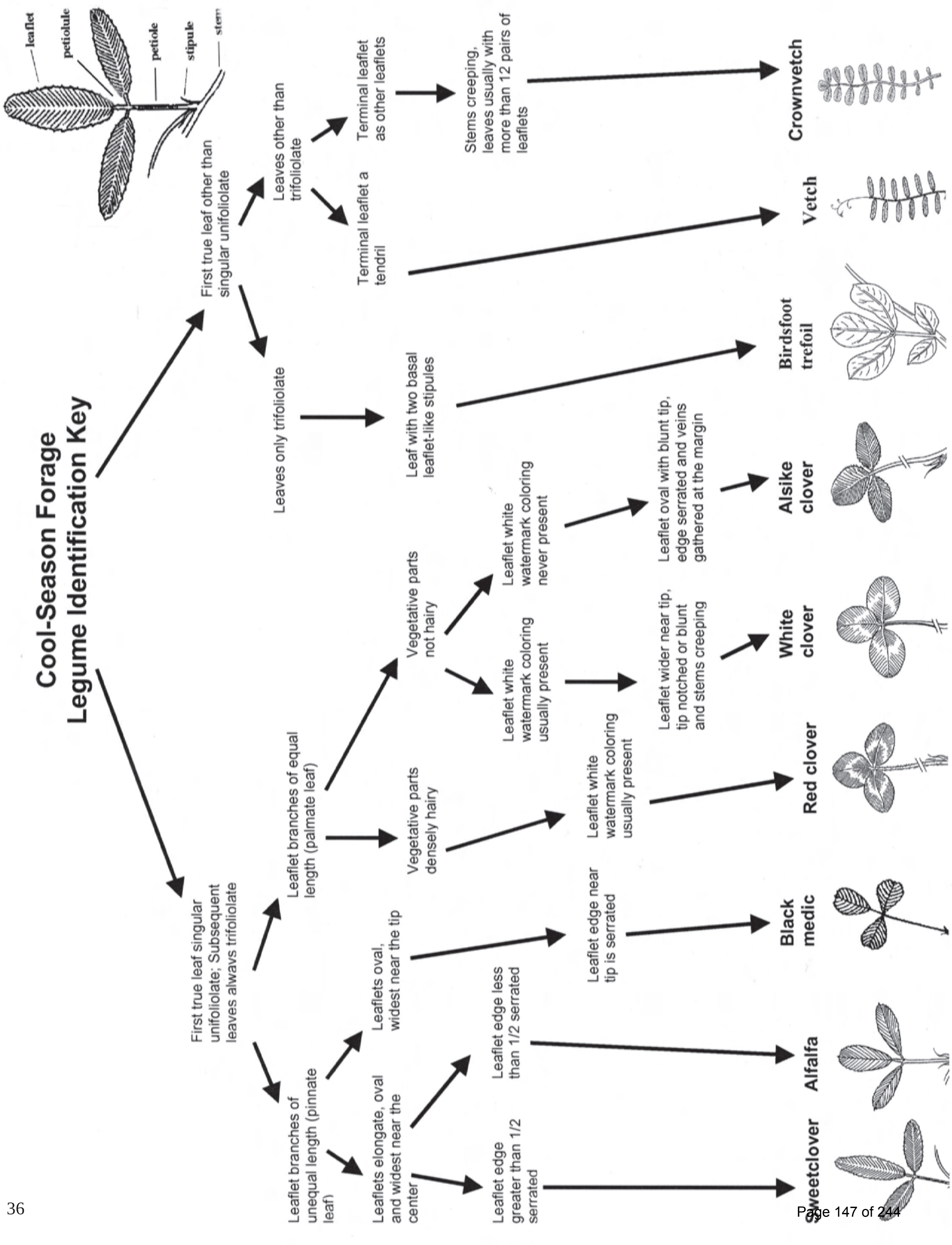
FORAGE SUMMARY

					Forage Requirements Per Month (lbs. x 1000)						
Field	Kind of Forage	Yield/ Acre	Acres	Total Yield	Apr	May	June	July	Aug	Sept	Oct
Total lbs., Produced from Forage (x 1000)											
Total lbs., Required for Livestock (x 1000)											
Total lbs., Excess or Deficiency (x 1000)											

Appendix B1. Identification Key for Common Forage Species – Grass



Appendix B2. Identification Key for Common Forage Species – Forage



C1. Determining Grassland Condition/Trend

Producer: ______________________

County: ______________________

Tract #: ______________________

Date: ______________________

Recorded By: ______________________

	Field #					
	Acres					
	Month & Year	M __ Y __	M __ Y __	M __ Y __	M __ Y __	M __ Y __
Category	**Score**	**Value**	**Value**	**Value**	**Value**	**Value**
1) Species Composition	Undesirable Desirable 0 1 2 3 4					
2) Plant Diversity	Narrow Broad 0 1 2 3 4					
3) Plant Density	Sparse Dense 0 1 2 3 4					
4) Plant Vigor	Weak Strong 0 1 2 3 4					
5) Legumes in Stand	Less than 10% More than 40% 0 1 2 3 4					
6) Plant Residue	Deficient Appropriate Excess 0 2 4 2 0					
7) Uniformity of Use	Spotty Intermediate Uniform 0 1 2 3 4					
8) Severity of Use	Heavy Moderate Light 0 2 4 2 0					
9) Woody Canopy	More than 40% Less than 10% 0 1 2 3 4					
10) Soil Erosion	Severe Moderate Slight 0 1 2 3 4					

Appendix C2. Inventory Category Items

1) **Species Composition -** Visually estimate the % composition by weight of each group of plants and assign a value. The categories desirable, intermediate, and undesirable refer to the preferred use of the plants by the grazing animal, and intended use of the grazing land. The score ranges from "0", with no or few desirable or intermediate plant species, to "4", which represents mostly desirable or intermediate plant species present.

2) **Plant Diversity -** Evaluate the number of different species of plants that are well represented on the site. If only one species of plant occurs, diversity is narrow; if eight or more species of plants are present, diversity is broad. If 4-5 plant species are present, the score would be in the middle of this range.

3) **Plant Density -** Ignore plants classified as undesirable. Visually estimate the density of living desirable and intermediate plant species that would be present at a 2-inch stubble height. Ask yourself if there is room for more desirable plants? Scores range from Dense (>95%), Medium (75-85%), Sparse (<65%).

4) **Plant Vigor -** Evaluate the health and productivity of the desirable and intermediate plant species. Look for evidence of plant color; leaf area index; plant reproduction; presence of disease or insects; rate of growth and re-growth, etc. Area plants growing at their potential?

5) **Legumes in Stand -** Visually estimate the % composition by weight of the legumes present in the stand on the area being evaluated. 0 = <10%, 1 = 10-19%, 2 = 20-29%, 3 = 30-39%, and 4 = >40%.

6) **Plant Residue -** Evaluate the dead and decaying plant residue on the soil surface. Excessive levels of residue inhibit plant growth and vigor. Appropriate levels of residue do not inhibit plant growth but help retard runoff, reduce soil erosion, improve water intake, recycle nutrients to the soil surface, and provide a favorable microclimate for biological activity. Deficient residue levels result in bare or near bare ground beneath the growing plants.

7) **Uniformity of Use -** Evaluate how well the animals are grazing all plants to a moderate uniform height throughout the field. Spotty grazing appears as uneven plant heights, with some plants or parts of the field grazed heavily and other areas grazed only slightly or not at all.

8) **Severity of Use -** Evaluate the severity of use by grazing animals based on plant stubble height in the field. For cool season grass species and legumes a stubble height of less than 2 inches would indicate heavy use; stubble height of 2-6 inches would indicate moderate use; and stubble height more than 6 inches would indicate light use. For warm season grasses increase the height in each category by 2 inches inches.

9) **Woody Canopy -** Estimate the percent canopy (area shaded at noon) of woody plant cover over six feet tall. 0 = >40%, 1 = 30-39%, 2 = 20-29%, 3 = 10-19%, 4 = <10%.

10) **Soil Erosion -** Visually observe signs of any type of erosion and assign a severity rating for the field being evaluated.

Appendix D1. Average Forage Yields for Northern Minnesota and Northern Wisconsin

			--------------------% Availability by Month--------------------					
Species	Quality	Yield (lb/a DM)	May	June	July	Aug	Sept	Oct
Cool Season Grasses								
Kentucky Bluegrass	Good	4700	30	20	20	10	15	5
	Poor	1240	15	45	15	10	10	5
Orchardgrass	Good	5580	25	20	20	15	15	5
	Poor	1520	20	35	20	10	10	5
Reed Canarygrass	Good	5460	25	20	30	10	10	5
	Poor	1940	25	30	20	10	10	5
Smooth Bromegrass	Good	4900	35	20	20	10	10	5
	Poor	1780	30	30	15	10	10	5
Tall Fescue	Good	6000	15	25	20	15	15	10
	Poor	1740	20	45	15	5	10	5
Timothy	Good	4800	25	30	15	10	15	5
	Poor	1600	15	50	10	10	10	5
Warm Season Grasses								
Big Bluestem	Good	3500	0	0	25	50	25	0
	Poor	2520	0	0	30	45	25	0
Switchgrass	Good	4830	0	0	35	50	15	0
	Poor	2170	0	0	30	45	25	0
Sudangrass	Good	5500	0	0	20	30	30	20
	Poor	3000	0	0	40	45	15	0
Legumes								
Alfalfa/grass	Good	5540	20	30	30	20	0	0
	Poor	3000	20	30	30	20	0	0
Birdsfoot Trefoil	Good	4320	10	40	35	15	0	0
	Poor	2500	10	40	35	15	0	0
Red Clover/grass	Good	5500	20	30	30	20	0	0
	Poor	2750	20	30	30	20	0	0
Alternative Forages								
Oat	Good	2500	55	35	10	0	0	0
	Poor	1600	60	40	0	0	0	0
Oat + Rape	Good	2410	30	45	25	0	0	0
	Poor	1600	30	45	25	0	0	0
Winter Rye	Good	2300	55	25	0	0	5	15
	Poor	1200	65	25	0	0	5	5

Source: Pastures for Profit: A Guide to Rotational Grazing, University of Minnesota, AG-FO-06145
Good Condition = lime, P, K and split N application plus rotational grazing management
Poor Condition = no fertilizer added plus continuous grazing management

Appendix D2. Average Forage Yields for Southern Minnesota and Southern Wisconsin

Species	Quality (lb/a DM)	Yield	May	June	July	Aug	Sept	Oct
			----------------------% Availability by Month----------------------					
Cool Season Grasses								
Kentucky Bluegrass	Good	5680	30	30	10	10	15	5
	Poor	1900	10	40	10	15	15	10
Orchardgrass	Good	6440	20	35	15	10	15	5
	Poor	2260	10	30	10	20	20	10
Reed Canarygrass	Good	6180	20	30	25	10	10	5
	Poor	2720	20	30	20	10	15	5
Smooth Bromegrass	Good	6080	30	30	15	10	10	5
	Poor	2620	25	35	10	10	15	5
Tall Fescue	Good	7940	20	30	20	10	15	5
	Poor	2740	15	40	10	10	15	10
Timothy	Good	6260	25	35	10	10	15	5
	Poor	2340	10	45	10	15	15	5
Warm Season Grasses								
Big Bluestem	Good	5000	0	10	40	35	15	0
	Poor	2520	0	15	40	35	10	0
Switchgrass	Good	5000	0	15	35	35	15	0
	Poor	2500	0	15	45	35	5	0
Sudangrass	Good	5500	0	0	20	30	30	20
	Poor	3000	0	0	40	45	15	0
Legumes								
Alfalfa/grass	Good	5820	20	25	35	20	0	0
	Poor	3000	20	25	35	20	0	0
Birdsfoot Trefoil	Good	5120	10	50	30	10	0	0
	Poor	2500	10	50	30	10	0	0
Red Clover/grass	Good	5500	25	40	20	10	5	0
	Poor	2750	25	40	20	10	5	0
Alternative forages (cool-season annual forages)								
Oat	Good	3000	55	35	10	0	0	0
	Poor	1600	60	40	0	0	0	0
Winter rye	Good	2800	55	25	0	0	5	15
	Poor	1200	65	25	0	0	5	5
Winter wheat	Good	2800	55	25	0	0	5	15
	Poor	1200	60	30	0	0	5	5

Source: Pastures for Profit: A Guide to Rotational Grazing, University of Minnesota, AG-FO-06145

[1]Good condition = lime, P, K and split N application plus rotational grazing management;

Poor condition = no fertilizer added plus continuous grazing management

Appendix E. Water Systems Design Considerations

A. Ramps to Surface Water:

Restricted access points consist of ramps which direct livestock to drink from limited areas of a lake, pond, or stream. During fence construction, a hard surface is installed to keep the livestock confined to the access point.

Advantages:

- Livestock will not have free access to open water sources except at controlled points, helping to reduce water quality problems.
- Capacity is not an issue, unless the water source is unreliable.
- No power required.

Disadvantages:

- High cost of construction and maintenance.
- Livestock still have access to open sources of water.
- Lack of portability; livestock need to travel to the source of water to get a drink.

B. Livestock Powered Pumps:

Livestock powered pumps (nose pumps) utilize a diaphragm pump which is lever-activated by the nose of the animal as they drink water from a cup cast into the unit.

Advantages:

- Simple and economical, costing half as much as a typical restricted access point.
- Easily moved from one water source to another and from paddock to paddock.
- No water storage required.
- No power required.

Disadvantages:

- Animals must be trained to use pumps.
- Smaller animals, such as calves may not have the strength to use them.
- Sheep will not use a nose pump.
- Generally can pump for distances less than 300 feet.
- Generally cannot lift water more than 30 feet.
- Must be anchored to something solid or a heavy base.

C. Solar Powered Pumps:

Solar panels are used to power direct current electric motors, usually 12 or 24 volt. The pumps can run continuously or the energy can be stored in a battery for use upon demand.

Advantages:

- Can operate in remote locations, no outside power required.
- Low maintenance.
- Can pump water for long distances.
- Variety of pumps and panels allows customization for your site.

Disadvantages:

- Expensive ($1500-6000).
- Must store water. A three-day reserve is recommended.
- Not easily portable.

D. Sling Pumps:

Sling pumps operate by the action of flowing water. The entire body of the sling pump rotates due to a propeller. Inside the pump body is a coiled, open-ended tube. This tube alternately picks up water and air, and forces the water out through an outlet hose. The water is normally stored in a tank and later distributed to the livestock. A wind-powered version is available for use on ponds.

Advantages:

- Can operate in remote locations without an outside power source.
- Low maintenance.
- Can pump for distances, just over 1 mile.
- Can lift water up to 80 feet.
- Low cost ($550-850).
- Portable; easily moved from one water source to another.

Disadvantages:

- Requires wind or water movement to operate.

E. Hydraulic Ram Pumps:

Ram pumps require flowing water, or water under pressure through a drive pipe, to operate. A minimum of 3 feet of fall is required to operate a ram pump. Normally, water is pumped to a storage tank for further distribution to drinking facilities in paddocks.

Advantages:

- Economical to operate.
- No outside energy required, can operate in remote locations.
- Reliable, with few moving parts.
- Can lift water to a maximum of 250 feet.
- Can pump water for a relatively long distance.

Disadvantages:

- Adequate water flow required to operate the pump.
- Must be anchored to a solid base.
- Not portable.
- Must be protected from frost, or drained for the winter.
- Overflow water must be drained from the area in which the pump is installed.
- Cost range from $350 for a small pump to $7000 for a large pump.

Appendix F. Visual Method for Calculating Reserve Herd Days (RHD)

Paddock No.	RHD	Notes
Total RHDs		

Appendix G. Calculated Method for Reserve Herd Days (RHD)

Kind and Number of Livestock:

Total Herd Weight:

Daily Allocation (Total Herd Weight x 0.04):

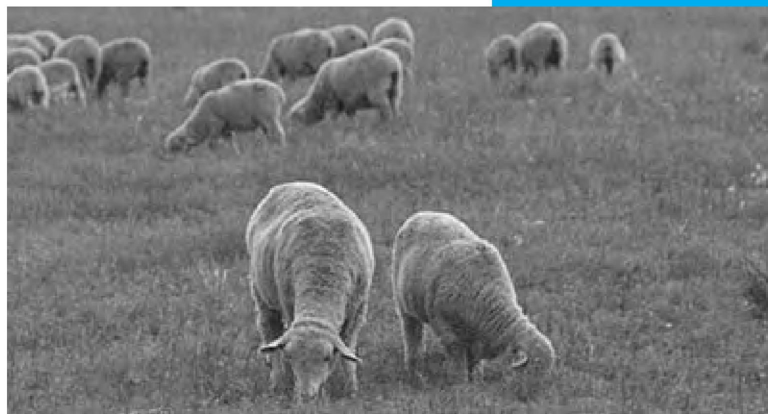
(a)	(b)	(c)	(d)	(e)	(f)	(g)
Paddock No.	Acres	Forage Available (inches)	Pounds of Forage per acre per inch*	Pounds of Forage Available (b x c x d)	RHDs**	REMARKS

* Refer to Table 6
** RHD = column (e) divided by Daily Allocation

Grazing Plan Checklist

This list identifies the primary components of a grazing plan. Addressing each of these will result in a detailed plan for proper management of a forage-based livestock operation.

- ❒ Sensitive Areas
  - ❒ Sensitive Areas Identified and Described
  - ❒ Management Strategy for Protecting Sensitive Areas
- ❒ Livestock Summary
  - ❒ Livestock Kind and Class
  - ❒ Livestock Number and Average Weight by Herd
  - ❒ Forage Balance Sheet
- ❒ Fencing System
  - ❒ Kind of Fence Defined
  - ❒ Fence Locations Shown on Map
  - ❒ Length of Fence to be Constructed
- ❒ Livestock Watering System
  - ❒ Water Source Identified
  - ❒ Location of Pipelines Shown on Map
  - ❒ Locations of Permanently Placed Tanks Shown on Map
  - ❒ Length of Pipeline and Number of Tanks
  - ❒ Emergency Watering Plans Outlined
- ❒ Heavy Use Area Protection
  - ❒ Locations Shown on Map
- ❒ Forages
  - ❒ Forage Species Identified
  - ❒ Condition of Pastures Documented
  - ❒ Forage Production Estimates Made
  - ❒ Detailed Seeding Plans Prepared
- ❒ Grazing System Management
  - ❒ Guidance for Initiating and Terminating Grazing
  - ❒ Contingencies for Wet Weather and Drought Defined
  - ❒ Grazing Management Prior to Fall Freeze Addressed
  - ❒ Forage Deficiencies and Surpluses Addressed
  - ❒ Sacrificial Paddocks Identified
  - ❒ Rejuvenation of Sacrificial Paddocks Addressed
  - ❒ Livestock Over-wintering Areas Identified
  - ❒ Brush and Weed Control Addressed
  - ❒ Pasture Fertilization Addressed



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Attachment K: Annual Range Forage Production

Annual Range Forage Production

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UNIVERSITY OF CALIFORNIA
Division of Agriculture and Natural Resources
http://anrcatalog.ucdavis.edu

California Rangelands Research and Information Center
http://agronomy.ucdavis.edu/calrng/range1.htm

California's foothill rangelands make up the primary forage source for the state's range livestock industry (FRRAP 1988). Forage productivity in California's annual rangelands varies greatly from season to season and from year to year. While predicting the productivity of these annual rangelands has been an elusive research objective, analysis of long-term forage production data from the San Joaquin Experimental Range (SJER), UC Hopland Research and Extension Center (HREC), and UC Sierra Foothill Research and Extension Center (SFREC) (Figure 1) has allowed researchers to describe seasonal and annual variation of this forage resource (Murphy 1970; Pitt and Heady 1978; Pendleton et al. 1983; George et al. 1988a, 1988b, 1989). The descriptions and data in this publication will help range managers identify potential forage gaps, fine-tune grazing plans, and develop contingency plans for drought.

Four factors—precipitation, temperature, soil characteristics, and plant residue—largely control forage productivity and seasonal species composition. Precipitation and temperature control the timing and characteristics of four distinct phases of forage growth: *break of season, winter growth, rapid spring growth,* and *peak forage production.* Management decisions may be guided by these patterns, and as the season progresses patterns become set and the outcome becomes more predictable.

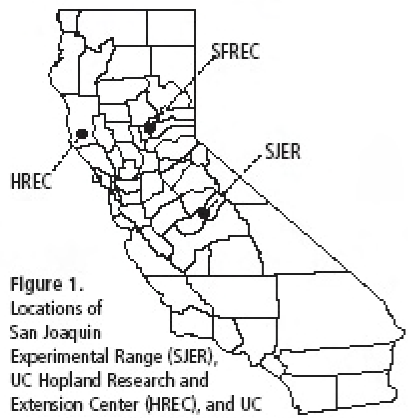

Figure 1. Locations of San Joaquin Experimental Range (SJER), UC Hopland Research and Extension Center (HREC), and UC Sierra Foothill Research and Extension Center (SFREC).

WEATHER-RELATED INFLUENCES

The new fall growing season (break of season) begins when rains start the germination of stored seed (Table 1). Young annual plants then grow rapidly if temperatures are warm (60° to 80°F [15.6° to 26.7°C]) but more slowly if cooler temperatures prevail (40° to 50°F [4.4° to 10°C]) (George 1988b). There is little growth during winter when temperatures are low (40°F [4.4°C] or less). Rapid spring growth commences with warming conditions in late winter or early spring. Rapid growth con-

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Table 1. Influence of normal weather variations on timing of seasonal dry matter (DM) forage productivity in California's annual grassland ecosystem

Weather pattern	Curve in Figure 2	Break of season date	Onset of winter growth		Onset of rapid spring growth		Peak standing crop	
			Date	DM (lb/ac)	Date	DM (lb/ac)	Date	DM (lb/ac)
Average fall, winter, and spring	A	Oct 23	Nov 7	600*	Feb 1	700†	May 1	2000‡
Warm, wet fall, average winter and spring	B	Oct 1	Nov 7	1000	Feb 1	1100	May 1	3000
Cold, wet fall, average winter and spring	C	Oct 23	Oct 23	—	Feb 1	300	May 1	1000
Dry fall, average winter and spring	D	Nov 15	Nov 15	—	Feb 1	300	May 1	1000
Average fall, cold winter, average spring	E	Oct 23	Nov 7	600	Feb 1	300	May 1	1500
Average fall, mild, winter average spring	F	Oct 23	Nov 7	600	Feb 1	1000	May 1	3000
Average fall, short winter, early spring	G	Oct 23	Nov 7	600	Jan 15	700	May 1	3000
Average fall, long winter, late spring	H	Oct 23	Nov 7	600	Apr 1	700	May 1	1500

*Forage production from break of season to onset of winter growth (Oct. 23–Nov. 7 in this example).

† Forage production from break of season to onset of rapid spring growth (Oct. 23–Feb. 1 in this example).

‡ Forage production from break of season to peak standing crop (Oct. 23–May 1 in this example).

tinues for a short time until soil moisture is exhausted. Peak standing crop occurs at the point when soil moisture limits growth or when plants are mature. Table 1 and Figure 2 describe an average weather pattern and seven variations that can result in greater or less than average forage production, based on weather and forage production records kept at SJER (George et al. 1988a, 1988b, 1989). Patterns of slow and rapid fall, winter, and spring growth have been documented over a 16-year period at SFREC (Table 2). Two years of data from Humboldt County contrast normal and cold spring growing seasons in an annual grassland with a long growing season (Table 3).

Break of season follows the first fall rains that exceed 0.5 to 1 inch during a 1-week period (Bentley and Talbot 1951). This may occur at any time from September 15 until January 1 (George et al. 1988a). Early false breaks may occur in summer or early fall, but plants that emerge then may not survive until the true break. Taprooted filaree (*Erodium* spp.) is one of the few exceptions that often survive a false break. The timing of the break dramatically affects forage production because earlier rains usually coincide with warmer temperatures, resulting in rapid fall growth and a longer fall growing season (Figure 2 A–D).

The *winter growth period* begins as fall growth slows due to cooling temperatures, shorter days, and lower light levels. Forage growth may be sparse during this period and dry matter losses may occur (Figure 2 E). Forage production is greater during mild winters (Figure 2 F). A short winter growth period or none at all may occur if there is a late break of season. Under those circumstances, almost no new growth is apparent in the fall.

Table 2. Monthly and annual forage production (lb/ac) for 16 growing seasons at the UC Sierra Foothill Research and Extension Center

Year	Germinating rain*	Dec 1	Jan 1	Feb 1	Mar 1	Apr 1	May 1	Peak crop	Peak % of avg.
1979-80	Oct. 20				500	1300		1670	60%
1980-81	Nov. 30				350	1385		2560	91%
1981-82	Sep. 24				550	1357		2770	99%
1982-83	Sep. 17				800	2142		4630	165%
1986-87	Sep. 18				204	810		1486	53%
1987-88	Oct. 23				214	793		1071	38%
1988-89	Nov. 8			694				2527	90%
1990-91	Nov. 25			162		691		2565	92%
1991-92	Oct. 26		383					2984	107%
1992-93	Oct. 21			367	631	2260		4696	168%
1993-94	Oct. 15				410	1282		2767	99%
1994-95	Oct. 4		547		569	1521	3074	3213	115%
1995-96	Dec. 7		350	664	950	1075	3089	4123	147%
1996-97	Oct. 25		623	583	1590	2827	3201	3201	114%
1997-98	Oct. 8	280		341	438	956	2073	2797	100%
1998-99	Sep. 27		211	254	316	604	1463	1746	62%
Average	Oct. 20		423	438	579	1357	2580	2800	100%

* 0.5 inches of precipitation in one week is a germinating rain.

Rapid spring growth begins with the onset of warming spring temperatures, longer days, and higher light intensities (Figure 2 G and H). Normally this period begins between February 15 and March 15, when average weekly temperatures exceed 45°F (7.2°C). The length of the rapid spring growth period varies considerably in California, from as little as 1 month in dry southern regions to more than 3 months in wetter coastal regions (Table 3).

Peak forage production occurs at the end of rapid spring growth (peak standing crop), which can come as early as April 1 in the southern San Joaquin Valley or as late as May 25 on the north coast. A late date for peak standing crop means adequate rains will be needed in April or early May. The date of peak standing crop on a single site may vary widely across years and according to species composition. In years when filaree dominates, peak standing crop will come earlier than in years of grass dominance. In some years and on some sites, summer-growing annuals contribute significant additional growth.

Moisture from summer storms, although not normally important for plant growth, leaches nutrients from standing dry forage (Hart et al. 1932) and may speed decomposition. Standing residue frequently shatters into ground litter, especially where filaree is dominant.

Table 3. Season forage production (lb/ac) for two growing seasons on a ridge 400 feet above sea level and 2 miles east of Cape Mendocino in Humboldt County

	Date									
Year	Dec 1	Jan 1	Feb 1	Mar 1	Apr 1	May 1	Jun 1	Jul 1	Aug 1	Sept 1
1997–98	88	132		574	1532	2977	3643	4050	4218	4351
1998–99	49	80			122	753	2690	3082	3148	3229

SITE-RELATED INFLUENCES

The available water for plants depends mainly on rainfall, but it is also affected by soil depth, soil texture, aspect, and topography. Annual plants depend primarily on the moisture available in the top 1 foot of soil. Filaree and summer annual forbs may make considerable use of water at greater depths.

Soil type. Clay soils hold moisture and provide a buffering effect when rains are widely spaced, and as a result the rapid growth period in such soils may be longer than in others. These soils typically occur in swale areas that collect additional moisture from runoff. Conversely, upland slopes tend to be drier because of high runoff and lighter-textured soils. Aspect is also a factor since south-facing slopes dry faster than north-facing slopes. Production curves illustrated in Figure 2 may differ for adjacent sites and for south- and north-facing slopes.

Fertility. California soils vary tremendously in their fertility. Nitrogen (N) is generally the most limiting nutrient in California's annual rangeland soils, but phosphorus (P) and sulfur (S) may become secondary limiting factors. Where deficient, addition of N, P, and S can substantially improve range forage productivity (Frost and Duncan 1989).

Soil pH. Species composition of legumes is influenced by soil pH. Annual grassland soil pH values range from alkaline to acidic. Acidic soils tend to occur in high-rainfall areas, whereas alkaline soils tend to occur in drier southern areas; pH values may vary from 4.5 in high-rainfall zones to 8.5 in lower-rainfall zones.

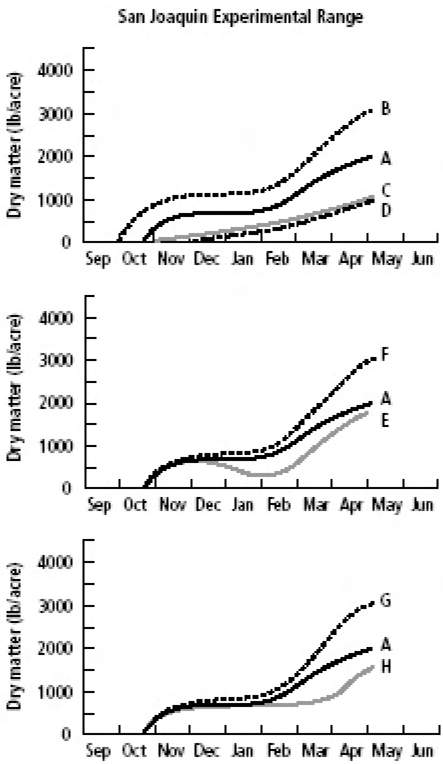

Figure 2. Range forage production curves (A–H in Table 1) showing influences of eight different weather patterns.

SITE COMPARISONS

Sites vary considerably in their patterns and amounts of annual forage production. One of the longest-running projects to monitor annual forage production is still in progress at SJER in Madera County. Started by the U.S. Forest Service in 1935–1936, the project is continued today by UC Cooperative Extension researchers. Forage production at this site averages about 2,300 lb/ac (2,576 kg/ha) but has ranged from less than 900 lb/ac to 4,500 lb/ac (1,008 to 5,040 kg/ha) (Figure 3). The average annual precipitation at SJER is about 18.7 inches (477 mm).

The UC Hopland Research and Extension Center (HREC) began monitoring seasonal production in 1952–1953 (Figure 3). The average annual production at the site is 2,300 lb/ac (2,576 kg/ha), with a range from 900 to 3,500 lb/ac (1,008 to 3920 kg/ha). The average annual precipitation at Hopland is

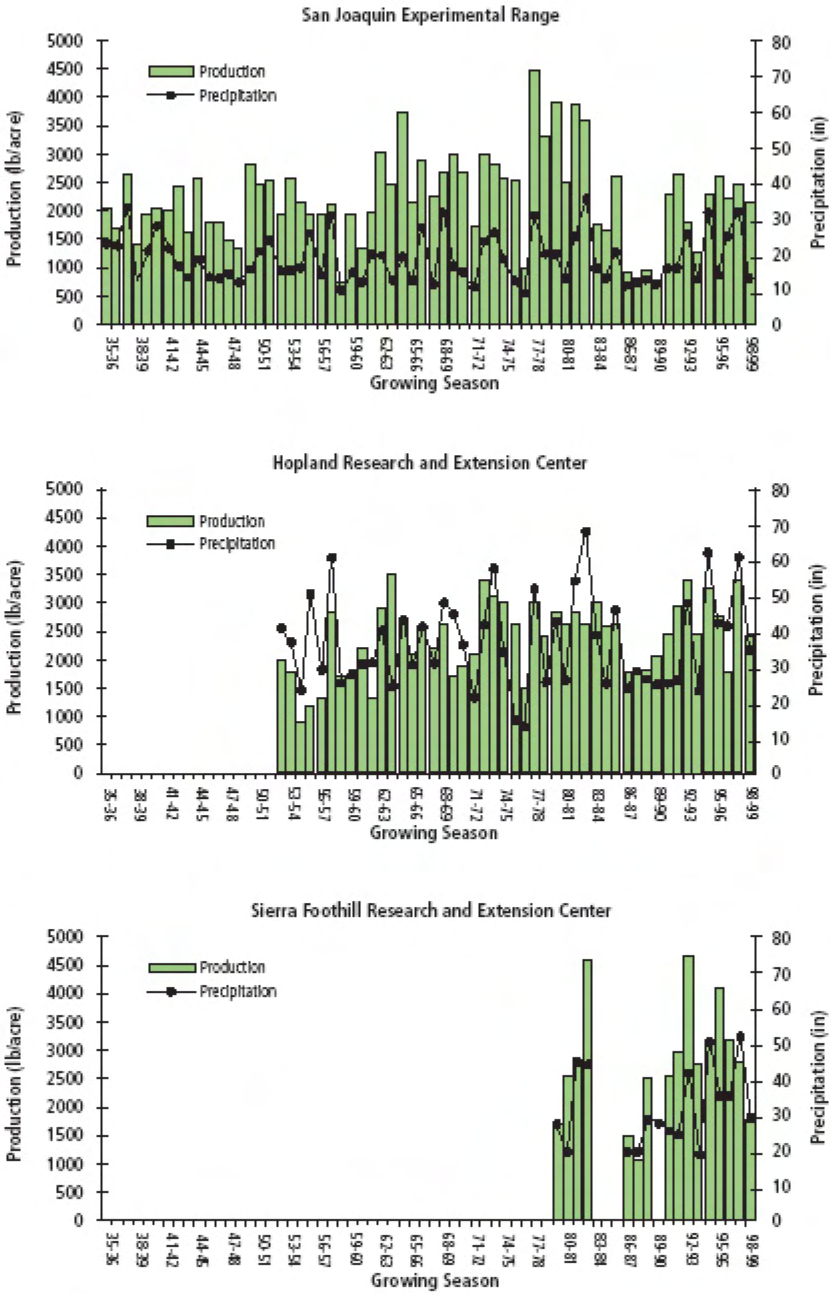

Figure 3. Annual rangeland peak standing crop at San Joaquin Experimental Range (1935–1999), UC Hopland Research and Extension Center (1951–1999), and UC Sierra Foothill Research and Extension Center (1979–1999).

36.8 inches (935 mm). The UC Sierra Foothill Research and Extension Center (SFREC) started monitoring seasonal productivity in 1979–1980 and reports an average annual production of 2,800 lb/ac (3,136 kg/ha) with a low of 1,071 lb/ac and a high of 4,696 lb/ac (1,200 and 5,260 kg/ha) (Table 2 and Figure 3). The average annual precipitation at SFREC during this period was about 31.5 inches (800 mm). The average precipitation at SFREC since rainfall records were started in the 1960s is 28.9 inches (734 mm).

Analysis of the long-term data sets from HREC and SJER have shown that peak standing crop is heavily influenced by fall and winter weather variables at the more northerly HREC, while at SJER it is more dependent on spring weather conditions. Studies have shown that fall and winter precipitation, winter temperature, and winter dry period patterns have a strong influence on peak standing crop at HREC while spring precipitation has a strong influence on peak standing crop at SJER (George et al. 1989).

RESIDUE AND GRAZING INFLUENCES

Residual dry matter, the dry forage component remaining at the end of the dry season, is a major manageable factor governing productivity and composition. Residue, acting as a mulch, influences germinating plants and soil organic matter. To maintain desired forage production, therefore, it is useful to set minimum residue standards (see UC ANR Publication 21327, *Guidelines for Residue Management on Annual Range*). These standards vary from 200 pounds of dry matter per acre (224 kg/ha) in the south to 1,250 lb/ac (1,400 kg/ha) on north coast steep slopes. The retaining of greater amounts of residue does not enhance total forage productivity, but it may be desirable in terms of other management objectives.

A lower amount of residue in fall encourages higher proportions of the following species: Silver European hairgrass (*Aira caryophyllea*), turkey mullein (*Eremocarpus setigerus*), quakinggrass (*Briza minor*), nitgrass (*Gastridium ventricosum*), broadleaf filaree (*Erodium botrys*), burclover (*Medicago polymorpha*), redstem filaree (*Erodium cicutarium*), and clovers (*Trifolium* spp.).

A high amount of residue in fall encourages dominance by slender wild oats (*Avena barbata*), soft chess (*Bromus hordeaceus*), wild oats (*Avena fatua*), medusahead (*Taeniatherum asperum*, recently changed to *T. caput-medusae* according to Hickman 1993), and ripgut grass (*Bromus diandrus*). Grasses can shade out other species, so grass most often dominates when residue builds up due to favorable weather or light grazing pressure. Grazing opens the canopy, increasing the occurrence of legumes and other forbs. On a moderately utilized range, livestock do not graze heavily enough to make complete use of the available forage; for this reason, a patchwork of grasses and forbs is apparent.

WEATHER INFLUENCES ON ANIMAL PERFORMANCE

In 1951, Bentley and Talbot described three seasons based on the adequacy of annual range forage for beef cattle weight gains (Figure 4). The *inadequate green season* begins with the fall germination of stored seed. Cattle grazing this forage may lose weight, hence the term *inadequate green forage*. The onset and length of this period depends on prevailing weather conditions. If the fall and winter period is dry or cold, green forage production will be poor and range supplementation may be necessary to maintain cattle performance. If warm weather coincides with adequate precipitation, forage production will be greater and animal performance will improve. Dry residual forage from the previous growing season is commonly available for

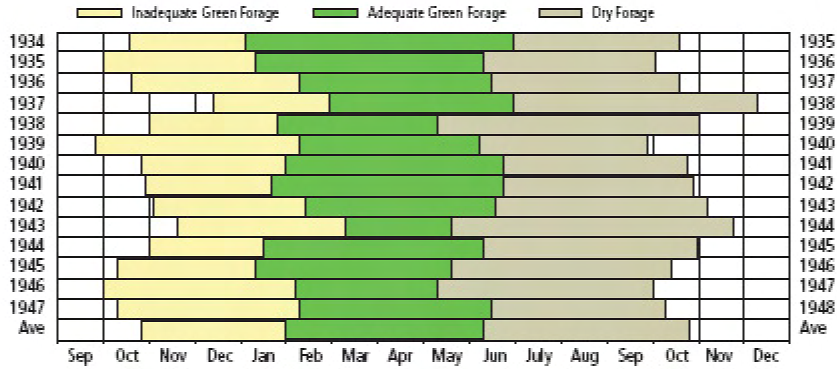

Figure 4. Variations in length of time of the inadequate green forage season, adequate green forage season, and dry forage season at the San Joaquin Experimental Range (Bentley and Talbot 1951).

grazing and provides energy, but it is low in protein and other vital nutrients (see UC ANR Publication 8022, *Annual Rangeland Forage Quality*). Leaching due to precipitation further decreases the nutritional quality of dry residue. The inadequate green forage may contain adequate energy, protein, phosphorus, and vitamin A on a dry matter basis. On occasion, however, livestock are unable to consume adequate forage to meet their need for these nutrients because of high forage water content.

Rapid spring growth commences with warming weather conditions in late winter or early spring. This is also the period when animal performance improves, and is commonly called the rapid spring growth or *adequate green forage season*. This forage usually is nutritionally adequate for growth, maintenance, reproduction, and gestation. Livestock weight gains are usually greatest during this period. In a study at SFREC, Raguse et al. (1988) reported that average daily gains of stocker cattle increased from December to early May and then rapidly decreased. Rapid spring growth continues for a short time until soil moisture is exhausted. Peak standing crop occurs at the point where soil moisture limits growth or when plants are mature. This period is followed by the summer dry season when the forage is a fair energy source but is low in protein, phosphorus, carotene, and other important nutrients. Livestock performance during this *inadequate dry season* may be poor without supplementation. During this summer period it is common practice to provide supplements, transport the stock to high-elevation green feed, or use irrigated pasture.

CONCLUSION

In summary, while rainfall determines the beginning and end of the growing season, temperature usually determines the rate of forage productivity during the growing season. Range managers cannot control the weather, but they can influence forage productivity and species composition by managing grazing to leave adequate residual dry matter.

During winter periods of slow forage growth, forage quantity and quality often are inadequate to support cattle weight gains. Forage quality and animal performance both decline rapidly as forage matures and dries following the depletion of soil moisture and the onset of the dry season. The frequency of poor forage seasons and years can be estimated from long-term data sets and d to assess risk and develop drought contingency plans.

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Attachment L: "Managers control forage levels and animal performances" by Melvin R. George, Marya E. Robbins, Fremont L. Bell, William J. Van Riet, Gary Markegard, David F. Lile, Charles B. Wilson and Quinton J. Barr

Above, controlled grazing system with grazed area (post-grazing herbage mass) in the foreground. At right, graduate research assistant Marya Robbins estimates herbage mass using a pasture probe.

By budgeting irrigated pasture growth rates . . .

Managers control forage levels and animal performance

Melvin R. George ❑ Marya E. Robbins ❑ Fremont L. Bell ❑ William J. van Riet ❑ Gary Markegard
David F. Lile ❑ Charles B. Wilson ❑ Quinton J. Barr

Traditionally, little control is exerted over grazing on irrigated pasture. Today, however, with controlled grazing and feed budgeting, the pasture manager can use grazing stock to control forage levels, and forage levels can be used to control animal performance. Pasture budgeting can be applied to California's irrigated pastures when estimates of expected pasture growth are available, according to an ongoing study.

Ranchers in New Zealand allocate forage in intensive grazing systems by budgeting pasture use along with rotating pasture use. The advantages are (1) grazing can be used to control forage levels and (2) forage levels can be used to control animal performance. Pasture forage budgeting requires knowing:

- The pregrazing herbage mass (HM) present in each paddock at the beginning of a rotation,
- The postgrazing herbage mass target,
- Expected pasture growth rate (PGR),
- Forage energy concentration, and
- The quantity and quality of supplemental feeds.

Because information on pasture growth rates is not readily available for California's irrigated pastures, we began monitoring pasture HM on five Northern California irrigated pastures where time-controlled grazing was practiced. Preliminary observations on this monitoring, begun in 1988, and the use of PGR in a pasture budget are reported here. Although forage budgeting does not require pasture conditions like those in New Zealand, we will compare PGRs of New Zealand with those of California.

How much HM is available?

Herbage mass (HM) is an internationally recognized term for the amount of dry matter in a pasture at any one time. Not all HM is available for consumption by stock. Some must be left behind to protect soil and support future pasture production; some is wasted by trampling and fouling. The first step in feed budgeting is to estimate HM (lb/ac) present at the beginning of a rotation. With reasonable accuracy, determining HM can be done visually by clipping or, as was done in this study, using a pasture probe. The pasture probe measures changes in electronic capacitance to estimate the weight of above-

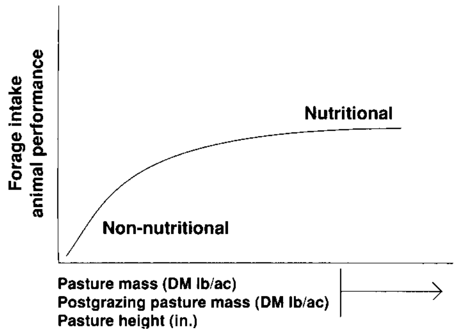

Fig. 1. Influence of forage level on forage intake and animal performance.

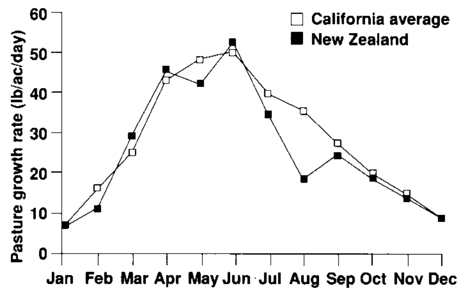

Fig. 2. Mean pasture growth rate for five Northern California irrigated pastures compared to inland and coastal pastures on New Zealand's North Island.

ground dry matter (DM). The pasture probe was calibrated with a large number of clipped samples.

Visual estimation of HM can be learned in a few hours by comparing estimates with clipped samples or with the pasture probe (several farm advisors have pasture probes). Estimate HM in units of 100 DM lb/ac. Pasture height can be used to roughly estimate pasture DM. Table 1 shows the general relationship between height and weight for cool-season irrigated pastures having a mixture of grass and clover. More accurate estimation of pasture DM is difficult because species composition, plant density, season and stage of growth vary. However, for feed budgeting purposes, estimates are usually adequate.

After grazing, what's left?

The amount of forage left after grazing depends on the level of animal performance desired. Figure 1 illustrates that to achieve high intake and high animal performance, high HM and allowance must be provided and stock must be moved before postgrazing HM declines to a low level. The practical importance of this relationship between pasture intake and pasture availability is that intake and animal performance can be controlled by rationing pasture to stock.

Figure 1 is divided into two distinct sections: non-nutritional and nutritional. The non-nutritional section, the ascending part of the curve, indicates how the animal's ability to harvest pasture limits intake and performance. These factors (intake and performance) are influenced by pasture structure and animal grazing behavior. In this part of the curve, intake and performance are very sensitive to changes in the amount of pasture allocated, so any errors in pasture allocation greatly affect animal performance.

At the plateau of the curve, such nutritional factors as digestibility and nutrient concentration appear to control intake and animal performance.

The amount of forage left after grazing can be used to control animal production. During the non-nutrient phase of figure 1, animal performance improves as the amount of forage left behind increases. To achieve maximum milk or meat production on pastures containing temperate forage species, it is common to have a target postgrazing mass between 1,200 lb/ac and 1,600 lb/ac, usually the equivalent of 3 to 4 inches of forage. Our example forage budget in table 2 uses a postgrazing HM of 1,400 lb/ac. Stock that can be maintained on a lower plane of nutrition than milk cows, growing calves and lambs may have a lower postgrazing HM target. New Zealand's postgrazing DM target for dry beef cows is 600 to 700 lb/ac; postgrazing target for beef cows in late pregnancy or late lactation is about 1,000 to 1,200 lb/ac DM.

Although California researchers have not conducted studies determining the postgrazing HM at which intake or performance is near maximum, research during the 1950s showed that animal performance increased if pastures were not closely grazed. The result: Cooperative Extension Service recommended leaving 4 to 6 inches of forage at the end of a grazing period.

What is the PGR?

Pasture growth rate (PGR) is the daily rate of forage production. In winter, PGR is slow, often less than 10 lb/ac/day. Dur-

TABLE 1. Approximate amounts of irrigated pasture dry matter present for Northern California irrigated pastures 1-12 in. in height

Height	Dry matter
in.	*lb/ac*
1	400 - 800
2	800 - 1,200
3-4	1,200 - 1,600
5-6	1,600 - 2,200
7-8	2,200 - 2,800
9-12	2,500 - 3,200
>12	3,000+

Definitions

Continuous grazing is grazing for extended periods without rotating to another paddock (pasture). Continuous grazing for several months or all year is common in California. It is called *set stocking* in New Zealand.

A ***controlled grazing system*** is a mixture of continuous and time-controlled grazing that is planned to meet farm production targets. Time-controlled grazing can be used to ration forage when PGRs are low or forage is being accumulated for later use. Continuous grazing is most useful when feed supply greatly exceeds demand and accumulation for later use is unnecessary.

Herbage mass (HM) is the amount of pasture per unit area. The amount of pasture is all that is above ground level and is expressed as lb DM/ac, where DM equals dry matter. Herbage mass is also called herbage dry matter or pasture mass.

Paddock is the term used internationally for individual fields in a grazing system. In the United States, these fields are usually called pastures. Rotational grazing systems, including cell grazing, have several paddocks, often separated by permanent electric fences.

Pasture allowance is the amount of pasture allocated to livestock; it is calculated by dividing pregrazing herbage mass by the number of animals per unit area and is expressed as lb DM/head/day or lb DM/lb liveweight/day.

Pasture growth rate (PGR) is the amount of daily forage increase on a dry matter basis (lb/ac/day).

Postgrazing herbage mass is the amount of pasture per unit area left after grazing. An indication of the intensity of grazing, it is expressed as lb DM/ac. It is also called postgrazing pasture mass.

Time-controlled grazing is a grazing rotation where rest periods vary with pasture growth rate (PGR). When PGR is rapid, grazing periods are short (2 to 4 days), followed by 20- to 35-day rest periods. When PGR is slow, grazing periods are longer (7 to 10 days), followed by 60 to 90 days of rest from grazing.

TABLE 2. Feed budgeting example

Assumptions

*10-acre pasture subdivided into seven paddocks with the following herbage mass (pregrazing HM):

Pasture	Area	HM	Total DM
No.	*a*	*lb/ac*	*lb*
1	1.5	2,200	3,300
2	1	2,500	2,500
3	1.5	2,200	3,300
4	2	1,800	3,600
5	1.5	1,800	2,700
6	1	2,000	2,000
7	1.5	1,500	2,250
TOTAL	10		19,650

*Grazing 30 head of 500-lb steers with a production target average daily gain of 1 lb/head/day.

*The NRC daily dry matter requirement for a 500-lb medium frame steer gaining 1 lb/day = 12.3 lb DM.This assumes a daily ME requirement of 11.8 Mcal and a pasture energy concentration of .96 Mcal ME/lb DM.

*Predicted PGR is taken from the Sutter County data in table 3.

*Steers growing 1.0 lb/day will have to leave a postgrazing HM of about 1,400 lb DM/ac after grazing; the pregrazing dry matter levels should be about 2,000 to 2,500 lb DM/ac.

Feed Budget

Total pasture present (lb) = 19,650

Subtract pasture which will be uneaten (postgrazing HM)
1,400 lb DM × 10 acres = 14,000

Therefore, pasture available at beginning of rotation = 5,650

Calculate additional pasture produced during 3 months of growth (see table 3):

Aug.	51 lb DM/ac/d × 10 acres × 31 days =	15,810
Sep	26 lb DM/ac/d × 10 acres × 30 days =	7,800
Oct.	17 lb DM/ac/d × 10 acres × 31 days =	5,270
TOTAL	92 days =	28,880

Therefore, total feed available to the steers is:

5,650 lb + 28,880 lb DM = 34,530 lb DM

Now calculate the feed requirements of the steers for the 3 months, if their growth rate is 1 lb/day. First calculate the midpoint weight:

Weight at end of 3 months
500 lb +1 lb/day × 92 days = 592

Midpoint weight at 46 days = 546

Use this midpoint weight to calculate the total feed requirements for steers over 92 days. Obtain the feed requirements of a 546-lb steer growing at 1 lb/day from the NRC tables: (12.3 lb DM/day/head)

25 steers × 12.3 lb DM × 92 days = 28,290 lb DM

Now, balance the available feed with the expected feed requirements of the steers:

Total feed available = 34,530 lb
Total feed demand = 28,290 lb

Surplus feed = 6,240 lb

Grazing Plan

Having established that there is sufficient feed, a grazing plan can be worked out by doing mini feed budgets for each of the paddocks, for example:

Paddock 1 (1.5 acres)

Total feed:	3,300 lb DM
minus uneaten feed: 1,400 lb/ac × 1.50 acres	−2,100 lb DM
Feed available:	1,200 lb DM

Daily feed requirement for 25 steers:

25 steers × 12.3 lb DM = 307.5 lb DM/day

So, the number of days steers can feed in Paddock 1:
1,200 lb DM ÷ 307.5 lb DM/day = 3.90 days (4 days)

Paddock 2 (1 acre)

Total feed	2,500 lb DM
minus uneaten feed:1,400 lb/ac × 1.00 acres	−1,400 lb DM
Feed available:	1,100 lb DM

Add to this the daily pasture growth, while the steers are in Paddock 1:

51 lb DM/ac/day × 1 acre × 4 days =	204 lb DM
26 lb DM/ac/day × 1 acre × 0 days =	0 lb DM
17 lb DM/ac/day × 1 acre × 0 days =	0 lb DM
Total feed available =	1,304 lb DM

So, the number of days steers can feed in Paddock 2:
1,304 lb DM ÷ 307.5 lb DM/day = 4.24 days (4 days)

Repeat above calculations for all paddocks for one rotation and develop a summary table:

FORAGE BUDGET SUMMARY FOR ALL PADDOCKS

Paddock number	Area	Pre-grazing herbage mass	Pre-grazing dry matter	Post-grazing herbage mass	Pre-grazing available forage	New growth	Available forage	Grazing period
	ac	*lb/ac*	*lb*	*lb/ac*	*lb*	*lb/ac*	*lb*	*days*
1	1.5	2,200	3,300	1,400	1,200	0	1,200	4
2	1	2,500	2,500	1,400	1,100	204	1,304	4
3	1.5	2,200	3,300	1,400	1,200	612	1,812	6
4	2	1,800	3,600	1,400	800	1,428	2,228	7
5	1.5	1,800	2,700	1,400	600	1,607	2,207	7
6	1	2,000	2,000	1,400	600	1,428	2,028	7
7	1.5	1,500	2,250	1,400	150	2,372	2,678	9
								44

The feed budget projected forage DM for 44 days. A second rotation could be planned starting on day 45. However, it is preferable to check actual forage levels and calculate a new budget at the beginning of a new rotation.

ing rapid spring growth, PGR can exceed 50 lb/ac/day. This is the amount of daily HM increase. Pasture growth rates were determined on five ranches in Northern California from 1988 to 1990, using an earth-plate capacitance meter (pasture probe). Pasture growth rate was determined from the change in HM between the beginning and end of a pasture rest period.

$$\text{PGR (lb/ac/d)} = \frac{\text{Ending HM} - \text{beginning HM (lb/ac)}}{\text{Ending date} - \text{beginning date (days)}}$$

Herbage mass was estimated weekly during rapid growth, biweekly during moderate growth and monthly during slow winter growth. Pasture growth rates for each month were averaged to get PGR estimates (table 3). Monthly PGR patterns and magnitude from the five irrigated pastures are similar to those of inland pastures on New Zealand's North Island (fig. 2).

How much energy is in forage?

Metabolizable energy (ME) is a measure of dietary energy available for metabolism after energy losses in the urine; combustible gasses (chiefly methane) are subtracted from digestible energy (DE). Metabolizable energy can be estimated from total digestible nutrients (TDN) or DE (2.2 lb of TDN = 4.4 Mcal of DE and ME = 0.82 × DE). Metabolizable energy is sometimes reported in metric megajoules (1 Mcal = 4.18 MJ). In New Zealand, growing perennial ryegrass/white clover pasture between 800 and 3,000 lb/ac HM has an energy concentration of 1.1 to 1.25 Mcal ME/lb DM. To simplify feed budgeting, growing pasture is usually assumed to have 1.2 Mcal ME/lb DM. In California, irrigated pasture ME ranged from 1.1 to 1.3 Mcal ME/lb DM (table 4).

Including supplements

Supplements included in a feed budget can make up for pasture deficits, provided the energy concentration of pasture DM is known. Irrigated pasture energy concentration varies from 1.1 to 1.3 Mcal of ME/lb DM. Other feeds can be compared with pasture on a relative basis. For example, the ME for good quality hay is 0.87 Mcal ME/lb DM and pasture contains 1.2 Mcal ME/lb DM. Therefore, 1 lb DM of hay will provide 0.73 times the energy of 1 lb DM from pasture. In other words, 1.38 lb hay is required to provide the same amount of energy as 1 lb pasture.

Feed demand

Feed requirements for different kinds and classes of stock at different levels of production can be determined from the National Research Council's "Nutrient Requirements of Domestic Animals." Feed budgeting is an imprecise process. If postgrazing HM for paddock 1 is lower than the target of 1,400 lb/ac, it may be desirable to reduce the grazing period or to decrease stock numbers. Feed budgets should overestimate feed requirements by 10 to 20% initially to reduce the risk of overstocking or of running out of feed prematurely. With experience, the pasture manager can fine tune the feed budget.

Feed budgeting example

Table 2, the feed budget, can be used to project answers to the following:

- Will forage run out and supplemental feeding be required?
- Will the target live weight gain or stocking rate need to be reduced?
- How long will the grazing period for each paddock be?

Conclusion

The PGR data presented here represent 3 years of monitoring five Northern California pastures. Monthly PGR varies annually according to changes in weather and management. However, these data can be used to illustrate the application of feed budgeting to Northern California. In the long run, knowing monthly PGR and the range of PGR variation (standard error) can improve assessments of weather-related risks associated with feed budget projections. Ranch feed budgets, however, should always include an emergency feed plan.

The premise of controlled grazing and feed budgeting is that the pasture manager can use grazing stock to control forage levels and the forage levels can be used to control animal performance. With this approach, pasture management becomes an active process of setting production targets and monitoring progress rather than a passive process resulting in low productivity. Controlled grazing requires planning and preparation. For those interested in pursuing intensive grazing management, livestock farm advisors throughout California offer short courses on ranch planning and grazing management.

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TABLE 3. Pasture growth rates for five Northern California* irrigated pastures compared to inland and coastal pastures on New Zealand's North Island†

	Pasture growth rate											
	Jan (Jul)	Feb (Aug)	Mar (Sep)	Apr (Oct)	May (Nov)	Jun (Dec)	Jul (Jan)	Aug (Feb)	Sep (Mar)	Oct (Apr)	Nov (May)	Dec (Jun)
	lb/ac/d											
NZ coast	24	33	50	58	63	73	59	61	50	41	32	25
NZ inland	7	11	29	45	42	52	34	18	24	18	13	8
Stanislaus	5	23	26	34	58	49	34	27	24	18	12	9
Glenn	7	11	27	43	52	39	41	34	25	17	9	7
Humboldt A	10	22	27	54	50	51	30	45	34	28	17	12
Sutter	7	13	28	45	50	56	49	51	26	17	8	4
Humboldt B	8	10	18	39	33	56	43	20	27	17	24	8
Calif. Average	7	16	25	43	48	50	39	35	27	19	14	8
NZ Average	15	22	39	51	52	63	46	39	37	30	22	16

*California pastures are various mixtures of perennial ryegrass (*Lolium perenne*), orchardgrass (*Dactylis glomerata*), tall fescue (*Festuca arundinaceae*), "Ladino" white clover (*Trifolium repens*), and strawberry clover (*T. fragiferum*).
†New Zealand (NZ) pastures are dominated by perennial ryegrass and white clover. NZ was adjusted by 6 months, so that July data are listed under January.

TABLE 4. Monthly irrigated pasture energy concentration (Mcal ME/lb/DM)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.20	1.30	1.30	1.20	1.20	1.09	1.09	1.09	1.09	1.20	1.20	1.20

Attachment M: Transitioning On and Off Pasture by Karen Hoffman USDA NRCS

Transitioning On and Off Pasture

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One challenge with grazing is how to help the cows adjust to a new feed source in both the spring and fall. Changing from lower-quality stored feeds to high-quality pasture is much like changing silos. If the change is made too quickly, milk production drops until the cows and the rumen microbes become accustomed to the new feed. The rumen microbes are especially sensitive to sudden changes, because it takes time to shift their numbers and types to those that are more adapted to higher quality forage.

The first day of grazing should be when the grass is only 3 or 4 inches tall, usually in mid to late April for most of NY or early to mid-May for Northern NY, and the length of time cows are let out should be relatively short (1-2 hours). If left out for longer than that, they will likely eat too much and when they return to the barn they may refuse quite a bit of the ration. Another option is to "flash graze" a large area of pasture, such as a large paddock with any temporary or semi-permanent fencing removed. This is useful in cases where the ground is still wet and the potential of pugging up the pastures with too much animal pressure is a concern.

Over the next few days, the length of time the cows spend on pasture should be gradually increased until they are out full time. At this point there will also be a gradual increase in the amount of feed they refuse in the barn. Depending upon what the "final" pasture ration is going to look like, protein forages such as haylage, baleage, and dry hay should be reduced first (unless the ration will be based on one of those forages). Next the amount of protein from grain or concentrate should be cut back, because the cows will be increasing their intake of protein from pasture.

If feeding a TMR, the easiest way to make the transition is to mix for 5 to10 fewer cows (depending on herd size) each day as they are refusing it anyway. When the TMR is being fed at a rate that is less than 70% of the full ration, begin reducing protein levels by 1 pound every 3 days. When the TMR is below 50% of normal, protein and NFC levels should be checked to make sure they are in balance, and at this time the TMR may need to be reformulated.

After 10 to 14 days of transitioning, the ration should be comprised of less than 10 pounds of dry matter from stored forage, and pasture dry matter intake should be greater than 15 pounds. Also, grain mixes should be below 16% protein (or protein concentrates should be fed at a rate of less than 2 pounds per cow).

In the fall, the concerns about changing to new feeds are essentially the same. However, there are a few new challenges. The stored forages to be fed are most likely from the new growing season. Since no two growing seasons are the same, the quality of the forages will be different from what was being fed earlier in the spring. It is hard to predict how the cows will respond to the new forages, in terms of both intake and performance. Also, determining when the grazing season will end can be difficult to predict. If transitioning begins too early, the opportunity to capture cheap, high quality feed may be lost. Likewise, if it is begun too late, the grass could run out before the stored forages have been introduced.

Predicting the end of the grazing season will be different every year depending on the weather and management of the pastures. In most of NY this will be in late October or early November, and in Northern NY it will be earlier in October in most years. Regardless of location or averages, it is important to try to predict the last day of grazing by using some simple planning techniques. Paddocks should be walked at least once a week beginning in mid-September, and the total amount of the grass dry matter available on the farm should be measured. Once the total "cover" on the farm is known, that number should be divided by the total amount of grass dry matter needed per day. The resulting number is an indication of approximately how many more days of grazing remain if the feeding program stays the same. When there is a significant difference in total grass available from week to week, a transition plan should be put in place.

Strategies for transitioning in the fall will be similar to spring – except things will happen in reverse. Stored forages should be introduced or increased in the barn. Cows should be kept in the barn at night once the temperatures begin to fall below 35 degrees (unless the plan is to outwinter). Eventually the amount of time the cows spend on pasture will be gradually diminished, especially after a frost has killed the grass and there is little to no new growth. At this point the winter ration should be developed, because the majority of intake will be provided in the barn.

Appendix:
Economic comparisons between grazing and non-grazing

1. Butler, L.J. and Gerry Cohn. 1993. "The Economics of New Technologies in Dairying: BGH vs. Rotational Grazing," in William C. Liebhardt (ed.), *The Dairy Debate: Consequences of Bovine Growth Hormone and Rotational Grazing Technologies* (pp. 189-246). Davis, CA: University of California Sustainable Agriculture Research and Education Program.
The authors compare the hypothetical profitability of two dairy technologies, BGH and MIRG. The main point is that in the former, gross revenues rise as do costs, while in the latter milk production falls but so do costs. On a per-cow basis, net revenue is shown to be the same, but on a per-cwt. basis MIRG has a $0.44 advantage. They also explore the effects of changes in milk prices, milk production, interest rates, feed costs, and government policies on the profitability of the two systems.

2. Carr, S.B., et al. 1994. "Results of Intensive, Rotational Grazing on a Virginia Dairy Farm." *Journal of Dairy Science* 77(11):3478.
This is an abstract from an ADSA meeting. A dairy farm converted to MIRG. Daily milk production and milk fat content both fell. Herd health increased. Cost of purchased feeds fell by more than half. Net cash income increased by 43%. Even more impressively, net income minus depreciation increased by 70%, and net income adjusted for inventory changes increased by 227%.

3. Conneman, George, et al. 1997. "Dairy Farms Business Summary: Intensive Grazing Farms New York 1996." Cornell University. Ithaca, NY.
A basic comparison of the profitability and the factors that seem to affect it for 30 grazing farms in NY. Factors investigated include percentage of forage coming from pasture, grain fed to cows, and frequency of rotations. Operating cost per cwt. was slightly lower on grazing farms than non-grazing ($11.29 vs. $11.84). Net farm income was much higher on grazing farms ($31,876 vs. $24,607). Report contains extensive data tables.

4. Conneman, George, et al. 1998. "Dairy Farms Business Summary: Intensive Grazing Farms New York 1997." Cornell University. Ithaca, NY.
Identical in form to study #18, but updated for 1998. Economic analysis is carried out on 35 grazing farms in NY. Operating cost per cwt. was slightly lower on grazing farms than non-grazing ($11.08 vs. $11.90). Net farm income was much higher on grazing farms ($19,705 vs. $9,502). Report contains extensive data tables.

5. Conneman, George, et al. 1999. "Dairy Farms Business Summary: Intensive Grazing Farms New York 1998." Cornell University. Ithaca, NY.
A continuation of reports #18 & 19, now updated for 1999. Economic analysis is carried out on 31 grazing farms in NY. Operating cost per cwt. was slightly lower on grazing farms than non-grazing ($10.53 vs. $11.26). Net farm income was much higher on grazing farms ($58,373 vs. $45,390). Report contains extensive data tables.

6. Conneman, George, et al. 2000. "Dairy Farms Business Summary: Intensive Grazing Farms New York 1999." Cornell University. Ithaca, NY.
A continuation of reports #18, 19, & 20, now updated for 2000. Operating cost per cwt. was slightly lower on grazing farms than non-grazing ($10.53 vs. $10.73). Net farm income was lower on grazing farms for the first time in four years ($42,858 vs. $43,135). Report contains extensive data tables.

7. **Hoard's Dairyman. 2003. "Save Money by Grazing Your Heifers."** ***Hoard's Dairyman*** **148(3):96.**
144 dairy heifers were split into two grazing groups and two feedlot groups. Grazing heifers gained slightly more weight. More significantly, total costs for grazing heifers was $0.95 per cow per day, versus $1.49 for feedlot heifers - an advantage of $0.54 per head per day.

8. **Dartt, Barbara and James Lloyd. 1998.** ***A Comparison of Management-Intensive Grazing and Conventionally Managed Michigan Dairies: Profitability, Economic Efficiencies, Quality of Life, and Management Priorities.*** **Unpublished thesis. Department of Agricultural Economics, Michigan State University. East Lansing, MI.**
This study compared 18 conventional dairies to 35 MIRG farms through surveys. Though asset levels were similar, grazing farms were 7% more profitable and 11% more capital efficient. Furthermore, grazing farms were 26% more "operating efficient" and 32% more "labor efficient." Both groups indicated a similar satisfaction with quality of life, though it was found that spouses from grazing farms took a more active role in the farm.

9. Dartt, B.A., et al. 1999. "A comparison of profitability and economic efficiencies between management-intensive grazing and conventionally managed dairies in Michigan." ***Journal of Dairy Science*** **82:2412-2420.**
A comparison of 35 grazing and 18 conventional dairies in MI. Grazing dairies proved to be more profitable than conventional dairies, exhibiting superior asset use, operational practices, and labor efficiencies. However, the confined geographic region of this study makes extrapolation to other regions very tenuous.

10. **Emmick, Darrell L. and Letitia F. Toomer. 1991. "The Economic Impact of Intensive Grazing Management on Fifteen Dairy Farms in New York State."** ***Forage and Grassland Conference.*** **American Forage and Grassland Council.**
Based on a study initiated by the Soil Conservation Service in 1989 of fifteen dairy farms in New York, the authors conclude that a more intensive use of pasture on many New York dairy farms could reduce input costs and enhance overall profitability, with the exception of large dairy operations or farms where there is an insufficient amount of pasture. On average, farms in the study which had switched to grazing saved $153 per cow per year compared to their operations prior to conversion.

11. **Ford, Steve. 1996. "Grazing Looks Better as Dairy Profits Tighten."** ***Farm Economics.*** **Cooperative Extension, Pennsylvania State University College of Agricultural Sciences. University Park, PA.**
Writing at a time of depressed prices for dairy farmers, the author argues that as feed costs increase and milk prices decline, grazing is a more and more attractive option. He cites several

bits of data to illustrate grazing's advantage, including 1) daily ration costs of confinement vs. grazing as grain prices rise and 2) breakeven yields for alfalfa and corn relative to grass pasture.

12. Gloy, B.A., L.W. Tauer and W. Knoblauch. 2002. "Profitability of Grazing Versus Mechanical Forage Harvesting on New York Dairy Farms." ***Journal of Dairy Science*** **85:2215-2222.**
Financial data from 237 nongrazing and 57 grazing farms in NY were compared using a regression analysis. Profitability between and among the two systems ranged widely and overlapped, though in general grazing systems were shown to be at least as profitable as nongrazing systems. Three factors have the strongest impact on profitability for graziers: herd size, milk production per cow, and milk prices.

13. Hanson, Gregory D. 1995. "Adoption of Intensive Grazing Systems." ***Journal of Extension*** **33(4).**
Production and financial data were obtained from a random stratified sample of 50 grazing farmers in PA. One interesting finding was that these farms were actually practicing moderate intensive grazing, not fully intensive grazing. Because of reduced costs, net returns to grazing were more than double those to a corn silage system and more than six times those to a hay operation. The article concludes by discussing the challenges facing Extension agents in disseminating grazing information to farmers.

14. Hanson, Gregory D., et al. 1998. "Profitability of Moderate Intensive Grazing of Dairy Cows in the Northeast." ***Journal of Dairy Science*** **81:821-829.**
Grazing dairies were compared to non- or partially-grazing dairies through USDA survey data. Though non-grazing dairies showed much higher gross farm incomes, grazing dairies showed higher returns per cow and net farm income, using fewer cows. Results of a survey of 50 PA graziers are also discussed.

15. Kliebenstein, James B., Carrol L. Kirtley and Lloyd A. Selby. 1983. "A Survey of Swine Production Health Problems a. Kliebenstein, James B., Carrol L. Kirtley and Lloyd A. Selby. 1983. "A Survey of Swine Production Health Problems nd Health Maintenance Expenditures." ***Preventive Veterinary Medicine*** **1(4):357-369.**
170 pork producers in MO reported disease and death information in a 1978-79 survey. Looking at expenditures for veterinary services, the pasture producers had the lowest overall costs. The average veterinary cost per animals for pastured pigs was less than half the average cost for confined pigs.

16. **Kole, Glenn, et al. 1992. "Utilizing Controlled Grazing on Dairy Farms in Northern Michigan."** ***Forage and Grassland Conference.*** **American Forage and Grassland Council.**
The authors report on the reduction in production costs of four farms in Northern Michigan that converted from conventional methods to controlled grazing. The range of savings on the four farms was $8200-15,000 in real dollars. Average savings across all four farms was $2/cwt. The text also mentions briefly the social and emotional benefits of controlled grazing for the farm family.

17. Kriegl, Thomas. 2000. "Wisconsin Grazing Dairy Profitability Analysis: Preliminary Fourth Year Summary." University of Wisconsin Center for Dairy Profitability. Madison, WI.
45 graziers in WI provided financial data, and comparisons are made between graziers and confinement operations. It is found that MIRG is an economically competitive system, that it is more economically flexible than a confinement system, and that it is not necessarily a reduced management system, but rather a different management system.

18. Kriegl, Thomas. 2001. "Wisconsin Grazing Dairy Profitability Analysis: Preliminary Fifth Year Summary." University of Wisconsin Center for Dairy Profitability. Madison, WI.
This report is a continuation of a longitudinal study (see #33), with a fifth year of data added. Again 45 grazing farms provided financial data. The conclusions drawn the year before are merely strengthened here: MIRG is an economically competitive and flexible system. It is also found that, on the whole, graziers have higher net income per cow and lower debt per cow than confinement farms.

19. Kriegl, Thomas. 2002. "Fact Sheet #5: Grazing vs. Confinement Farms." Regional Multi-State Interpretation of Small Farm Financial Data from the First Year Report on 2000 Great Lakes Grazing Network Grazing Dairy Data. University of Wisconsin Center for Dairy Profitability. Madison, WI.
This is a factsheet based on a larger report (study #3) that specifically points out the comparisons between graziers and confinement dairies in WI and NY. Net incomes per cow for grazier vs. confinement are $617 vs. $296 in WI and $315 vs. $181 in NY. Net incomes per cwt. are: $3.44 vs. $1.20 in WI and $1.38 vs. $0.65 in NY.

20. Kriegl, Thomas. 2004. "Fact Sheet #5: Grazing vs. Confinement Farms - Year 3." Regional Multi-State Interpretation of Small Farm Financial Data from the Third Year Report on 2002 Great Lakes Grazing Network Grazing Dairy Data. University of Wisconsin Center for Dairy Profitability. Madison, WI.
This is a factsheet based on a larger report (study #4) that specifically points out the comparisons between graziers and confinement dairies in WI and NY. Net incomes per cow for grazier vs. confinement are $651 vs. $641 in WI and $786 vs. $672 in NY. Net incomes per cwt. are $3.14 vs. $2.36 in WI and $2.86 vs. $2.34 in NY.

21. Kriegl, Thomas and Gary Frank. 2004. "An Eight Year Economic Look at Wisconsin Dairy Systems." University of Wisconsin Center for Dairy Profitability. Madison, WI.
Based on eight years of data, this is a comparison of net income per cwt. for three kinds of WI dairy farms: grazing, traditional confinement (50-75 cows), and large modern confinement (>250 cows). Under three different cost scenarios, MIRG farms consistently show the highest net incomes. When all operating costs are taken into account, grazing returned an average of $3.96/cwt. over 8 years; traditional confinement $2.39/cwt.; and large modern confinement $1.50/cwt.

22. Liebhardt, William C. 1993. "Farmer Experience with Rotational Grazing: A Case Study Approach," in William C. Liebhardt (ed.), *The Dairy Debate: Consequences of*

***Bovine Growth Hormone and Rotational Grazing Technologies* (pp. 131-188). Davis, CA: University of California Sustainable Agriculture Research and Education Program.**
The author presents in exhaustive detail the results of 12 case studies of dairy farms from 5 different states, plus the results of several other academic studies. Time after time, with tables of data to illustrate, the same theme is presented: feed costs are lower, labor demands are lower, milk production is sometimes lower, and profit is higher on grazing dairies than on confinement dairies.

23. Moore, K. C. and J. R. Gerrish. 1995. "Economics of Grazing Systems Versus Row Crop Enterprises." *Forage and Grassland Conference.* American Forage and Grassland Council.
The authors state that research in Missouri and Iowa has shown that net returns can be substantially improved under rotational grazing, and income will more than cover the costs of developing the necessary infrastructure, especially on erosive marginal land with poor crop yields. Using enterprise budgets, they compare the economics of beef production across a 3-year average for 3 intensities of grazing: 3-, 12-, and 24-paddock systems. Returns above cost per acre are $77, $104, and $109, respectively.

24. Mowrey, Coleen M., Carl E. Polan and Gordon E. Groover. 2000. "Can Grazing be Profitable?" *Hoard's Dairyman* 145(16):627.
The authors relate the results of five different studies in NY, PA, WI, and VA, each of which illustrates the same general phenomenon: despite lowered milk yields and lower gross incomes, grazing farms consistently bring higher profits per cow or higher returns to labor due to reduced input and labor costs. Even when grazing farms brought lower net incomes, they still brought greater returns to labor due to smaller assets.

25. **Murphy, William M. and John R. Kunkel. 1993. "Sustainable Agriculture: Controlled Grazing vs. Confinement Feeding of Dairy Cows," in William C. Liebhardt (ed.), *The Dairy Debate: Consequences of Bovine Growth Hormone and Rotational Grazing Technologies* (pp. 113-130). Davis, CA: University of California Sustainable Agriculture Research and Education Program.**
This chapter lays out three main criteria for "sustainable agriculture" -- profitability, quality of life, and positive rural landscape -- and then argues that MIRG satisfies the criteria better than confinement dairying. Topics are illustrated with case studies, and include: increased profitability, lowered costs and labor requirements, better herd health, higher quality of life for the farmer, reduced erosion on farmland, and more farmers farming.

26. **Murphy, William M., John R. Rice and David T. Dugdale. 1986. "Dairy farm feeding and income effects of using Voisin grazing management of permanent pastures." *American Journal of Alternative Agriculture* 1(4):147-152.**
An introduction to the Voisin grazing system is given. Forage samples were taken and dairy profitability measured on six VT grazing farms. On 3 farms where comparison was possible, net profits per cow were $67 more using MIRG than using continuous grazing the year before, due mainly to savings on feed costs.

27. Nichols, Matt and Wayne Knoblauch. 1996. "Graziers and Nongraziers Fared About the Same." ***Hoard's Dairyman*** **141(9):351.**
Selected elements of costs and profits were compared between a set of grazing and non-grazing farms in NY. When 15 graziers were matched up with 15 similar non-graziers and examined over 3 years, milk production was consistently lower but net farm income consistently higher for graziers. When those 15 graziers were compared to a non-matched group of 79 non-graziers, both milk production and net farm income were higher for graziers.

28. Noyes, T. E., M. L. Bennette and D. J. Breech. 1997. "Economic Survey of Management Intensive Grazing Dairies in Northeast Ohio." ***Forage and Grassland Conference.*** **American Forage and Grassland Council.**
The authors find that although Ohio farms using MIRG have lower gross income than non-grazing farms, they also have a higher net income due to the savings in cost of production. Net return per cow on MIRG farms was $447 and $468 for 1994 and 1995, respectively. By comparison, net return per cow for all dairy farms (including MIRG) was $400 and $429.

29. Olsen, Jim. 2004. "A Summary of Basic Costs and Their Impact on Confinement vs. Managed Intensive Rotational Grazing (MIRG)." Wisconsin Dairy Data. University of Wisconsin Center for Dairy Profitability. No. 2004-01. Madison, WI.
3 years of data on costs of production are compared between confinement and MIRG farms. MIRG farms featured significant cost savings in a number of categories, including Renting/Leasing ($87/head/yr); Other Livestock Expenses ($82/hd/yr); Depreciation of Purchased Breeding Livestock ($65/hd/yr); Purchased Feed Costs ($45/hd/yr); and Veterinary Expenses ($43/hd/yr). Overall, the MIRG farms held a $476/head/yr advantage in costs of production.

30. **Rust, J.W., et al. 1995. "Intensive Rotational Grazing for Dairy Cattle Feeding."** ***American Journal of Alternative Agriculture*** **10(4):147-151.**
Two groups of cows were either grazed (+ small supplementation) or confined over 2 years. Measurements of animal performance, forage quality, and profitability were taken. Confinement cows produced 7% more milk. Grazed cows produced a net return $53 and $44 greater than confinement cows in the 2 different years. Greatest cost economies resulted from reduced use of facilities and equipment and reduced labor.

31. Soriano, F.D., C.E. Polan and C.N. Miller. 2001. "Supplementing Pasture to Lactating Holsteins Fed a Total Mixed Ration Diet." ***Journal of Dairy Science*** **84:2460-2468**.
Cows were fed either TMR only, TMR+morning pasture, or TMR+afternoon pasture. Milk production was slightly higher with TMR cows. No significant differences were detected for milk fat, protein content, or body weight, but body condition was greater for TMR cows. Income-over-feed costs were 18.6% higher than TMR for afternoon grazing and 7.5% higher than TMR for morning grazing.

32. White, S.L., et al. 2002. "Milk Production and Economic Measures in Confinement or Pasture Systems Using Seasonally Calved Holstein and Jersey cows." ***Journal of Dairy Science*** **85:95-104.**
A four-year study comparing milk production and economic profitability of confinement and

pastured herds. Pastured cows produced 11% less milk, but feed costs for pastured herds averaged $0.95 less per cow per day. Significantly more confinement cows got mastitis and were culled. Overall, the tradeoff between milk yields and economic factors showed pasture-based systems to be economically competitive with confinement systems.

33. **Winsten, Jon, et al. 1995. "Economics of Feeding Dairy Cows on Well-Managed Pastures." University of Vermont. http://pss.uvm.edu/vtcrops/?Page=research/pasture/Economics.html.**
23 VT graziers in 1994 and 21 in 1995 were compared to 24 VT confinement farms which comprised the top quarter for per-cow profitability of farms using the Agrifax accounting system. Graziers earned $579 net income per cow over 2 years, while confinement farms averaged $451 per cow. Biggest savings occured in the areas of paid labor, cropping costs, repairs, and fuel.

34. **Winsten, Jonathan R., Robert L. Parsons and Gregory D. Hanson. 2000. "A Profitability Analysis of Dairy Feeding Systems in the Northeast."** ***Agricultural and Resource Economics Review*** **29(2):220-228.**
Data was obtained from a stratified random sample of 96 dairy farms in three categories: confinement, traditional grazing, and MIRG. Confinement farms had the highest milk production and milk sales, but also the highest grain expenses and veterinary expenses per cow. There were no significant differences in machinery use. Overall, confinement farms had the highest rate of return to assets (7.76%), followed by MIRG (5.83%). Traditional grazing lagged far behind.

35. **Winsten, Jonathan R. and Bryan T. Petrucci. 2003. "Seasonal Dairy Grazing: A Viable Alternative for the 21st Century." American Farmland Trust.**
The report begins by providing a good introduction to the many purported benefits of grazing, including environmental, farm labor, and farm profitability. Then case studies of six farms in four states (WI, MA, MI, PA) are presented, concentrating on farmers' histories with grazing, paddock construction, feeding practices, yields, and profitability. The farms usually achieve net incomes per unit well above their state averages, even when herd size or milk per cow is substantially lower than average.

36. **Zartman, D.L. (ed.). 1994. "Intensive Grazing/Seasonal Dairying: The Mahoning County Dairy Program." Department of Dairy Science, Ohio Agricultural Research and Development Center. OARDC Research Bulletin 1190. Wooster, OH.**
This is an exhaustive report on many elements of a 5-year grazing project conducted to assess the viability of MIRG for Ohio dairies. Consists of 12 chapters, mostly agronomy- and animal science-related. Milk production increased each year. Costs of production were found to be 27-30% below those used in conventional OH dairy budgets. Net farm income was also higher than the national dairy farm average in the year when the project sold Grade A milk.

Studies on animal and human health related to grazing

37. Bruun, J., A.K. Ersboll and L. Alban, 2002. Risk Factors for Metritis in Danich Dairy Cows. Preventive Veterinary Medicine, Volume 54, pp. 179-190.
2144 herds from 3 regions in Denmark, totally 102,060 cows. The risk for metritis was lower for cows in herds with grazing relative to cows in zero-grazing herds or in herds when cows grazed only when dry.

38. Clancy, Kate. Greener Pastures, How grass-fed beef and milk contribute to healthy eating. Union of Concerned Scientists, March 2006
http://www.ucsusa.org/food_and_environment/sustainable_food/greener-pastures.html

A comprehensive study that confirms that beef and milk from animals raised entirely on pasture have higher levels than conventionally raised beef and dairy cattle of beneficial fats that may prevent heart disease and strengthen the immune system. The study also shows that grass-fed meat is often leaner than most supermarket beef, and raising cattle on grass can reduce water pollution and the risk of antibiotic-resistant diseases.

39. Dhiman, T.R., et al. 1999. "Conjugated Linoleic Acid Content of Milk from Cows Fed Different Diets." *Journal of Dairy Science* 82:2146-2156.
This clinical trial consisted of four different experiments, each feeding a group of cows a different kind of diet. Examples include high oil diets, fish meal mixed with monensin, pasture + TMR, all pasture, and finely chopped alfalfa. Cows with all pasture and no supplements had 500% more CLA in their milk fat than cows on typical dairy diets.

40. Frankena, K., E. N. Stassen, J.P.T.M.Noordhuizen, J.O. Goelema, J. Schipper, H. Smelt, H. Romkema. Prevalence of lameness and risk indicators for dermatitis interdigitalis during pasturing and housing of dairy cattle. In: Thursfield, M.V. (Ed.), Proc. Annual Symp, Soc. Vet. Epidemiol. Prev. Med., London, pp. 107-118.
Reported effects of grazing included less severe hoof disorders and recovery from such disorders.

41. Nocek, James E., Hoof Health: Managing Cow Comfort to Reduce Lameness. Biovance technology, Omaha, NE, 2000.
Author makes recommendations for feedbunk design based on the natural behaviors or the cow and what is best for cow comfort. "When observed in her natural habitat, the cow had been adapted to eating in a natural grazing position, as in pasture. Studies have shown that cows will eat longer and produce more saliva during the eating process when they are consuming food in a grazing vs. a more horizontal position." It is a natural behavior to graze, which in turn produces more saliva, which aids in rumination.

42.G. M. Jones, Professor of Dairy Science, Extension Dairy Scientist. Milk Quality and Milking Management Proper Dry Cow Management Critical for Mastitis Control. Virginia Tech, Virginia Cooperative Extension. Publication Number 404-212, posted May 1999
Pasture has reduced the risk of environmental mastitis, but … pastures should be managed to prevent muddy areas where heifers or older cows would lie down, as exposure is increased when

cows have access to lots with limited shade trees, or pastures that are overgrazed, or grazed during periods of heavy rain.

43. Keil, N.M., T.U. Wiederkehr, K. Friedli and B. Wexchsler, 2005 (in press). Effects of Frequency and Duration of Outdoor Exercise on the Prevalence of Hock Lesions in Tied Swish Dairy Cows. Preventive Veterinary Medicine.
Exercise of long duration is generally associated with low prevalence of hock lesions, whereas frequent exercise of short duration is associated with high prevalence of lesions. "Having the cows remain outdoors for long periods of time is only possible in the case of pasture where cows move about while grazing and are also able to lie comfortably. By contrast, short periods of exercise include all occasions of being in the outdoor run where cows mainly stand and normally do not lie down due to the limited space and the inappropriate surface (mostly concrete or dirt surface, or rarely, wood shavings."

44. Strohlic, Ron. 2005 "Regulating Organic: Impacts of the National Organic Standards on Consumer Awareness and Organic Consumption Patterns" California Institute for Rural Studies (CIRS). http://www.cirsinc.org/docs/Regulating_Organic.pdf

45. C.C. Ketelaar-de Lauwere, et. al. Voluntary automatic milking in combination with grazing of dairy cows. Milking frequency and effects on behaviour. Applied Animal Behaviour Science, February 10,1999.
Cows spend 80-99.6% of their time lying when they have they have access to pasture. Lying time is a indicator of cow comfort and health. Findings support improved animal welfare. When cows had choice between indoors and outdoors, they spent most of their lying time in pasture. "Grazing seems to be advantageous for the welfare of the cows, as they clearly preferred to lie in the pasture rather than in the cubicles."

46.Murray, R.D., D.Y. Downham, M.J. Clarkson, W.B. Faull, J.W. Hughes, F.J. Manson, J.B. Merritt, W.B. Russell, J.E. Sutherst and W. R. Ward. Epidemiology of Lameness in Dairy Cattle: Descpription and Analysis of Foot Lesions. Veterinary Record 1996, Volume 138, pp. 586-591.
Study of 5000 dairy cattle found that the incidence of hoof lesions was lower for cows on grass. The incidence of hoof lesions was lower in summer when cows were grazing on pasture than it was during the winter months when cows were housed indoors.

47.C.S. Poulson, T.R Dhiman, A. L. Ure, d. Cornforth, K.C. Olson. Conjugated linoleic acid content of beef from cattle fed diets containing high grains, CLA, or raised on forages. Utah **State University. Livestock Production Science 91 (2004) 117-128**
The concentration of C 18:2 cis-9, trans-11 isomer of CLA in beef can be raised by as much as 466% by feeding forages and pasture only compared with beef from animals fed typical high-grain diets.

48.Wells, S.J., L.P. Garber and B.A. Wagner, 1999. Papillomatous Digital Dermatitis and Associated Risk Factors in US Dairy Herds. Preventive Veterinary Medicine. Volume 38, pp. 11-24.

Cows housed on dyrlots versus those on pasture were three times more likely to develop papillomatuous. The incidence of papillomatuous digital dermatitis among lactating cows housed only in drylots was 36.6% versus 10.7% for cows housed in pasture. Cows housed in pasture and drylot had a 21% incidence of PDD.

Answers to Questions Raised in the Proposed Rule

Answer to questions raised in the Proposed Rule:

1. **How will production costs be affected by the changes in the Proposed rule**

The NOP Standards have been in effect since 2002, and grazing was clearly a requirement for ruminants at that time. Any operations that now have to make additional investments to come into compliance will be adjusting to a more level playing field for all producers, making up for what should have been in place by 2003.

There are some initial capital costs of installing fencing and purchasing water line and water tanks when going to a grazing system, but much of it can be done very cheaply—with internal fencing provided by temporary step in posts and one strand of aluminum or polywire. At the same time, the increased use of pasture can give dairy farmers more control over their farm's cost of production.

One of the most under used assets that dairy farms have is the use of pasture. Grazing-based systems are alternatives to highly capitalized systems of equipment, storage, and housing infrastructure. Grazing systems rely on two primary resources: pasture, the lowest cost source of feed available (Soder and Rotz 2001), and the dairy farmer's management skills. Because the cow ingests the standing crop, all intermediate steps required to feed the cow are eliminated for any intake via grazing. Forage reaches the rumen in high quality condition, less purchased and / or on-farm machine harvested feed is needed, and manure handling and electricity use is reduced, all helping to lower costs significantly.

Grazing-based systems can help young people and new entrants become interested in and stay content with the lifestyle of dairy farming by reducing the long hours of hard work common to confinement systems. Start-up costs are also lower for grazing-based systems with lower capital investment compared to conventional dairies, a difference of $2,000 per cow or $200,000 for a 100 cow herd.[1] This can eliminate a significant problem for young people with little equity to purchase a herd, acquire basic equipment, and rent or buy a farm.

There are many species of grasses that can be incorporated into a pasture based system that have a demonstrated potential to significantly reduce the production costs for most dairy producers, leading to a higher net farm income. Economic studies have demonstrated that well-managed grazing-based dairy systems tend to have higher net incomes per cow than similar sized confinement-based farms.[2]

These increased economic benefits are primarily related to lower overall production costs, including crop production costs such as the following:

- Labor, machinery and fuel to plow, plant, and harvest
- Fertilizers, soil amendments, pesticides, and herbicides
- Transport and storage costs

Any significant reduction in input costs will most likely improve net farm income. The amount of forage that has to be mechanically harvested, placed into storage, and then fed back out of storage is reduced by one day for every day that the cows harvest their own feed through grazing. This generally amounts to at least 5 months in New England, depending on growing season

[1] Iowa State 2007 production costs

[2] Winsten et al. 1996; Cornell Dairy Farm Business Summary 1996–2000; Kriegel 2000, 2003

length. It can be profitable to extend the grazing season by widening the mix of forage crops by planting cool- and warm-season grasses and annual crops that grow or maintain their quality when other forage crops are dormant or low quality.

Grazing-based systems have also been found to lower the costs for animal care and replacement by prolonging the working life of the cow, significantly reducing the annual cull rate.

As an example, data from the 2005-2006 Cornell University, Dairy Farm Business Summaries indicates that on New York State dairy farms where technically sound systems of grazing management were implemented in conjunction with the recommended guidelines for supplemental feeding and livestock management, the net income per cow without appreciation averaged $386 per cow/yr higher than on farms where grazing was not utilized or utilized but not well-managed, that is $957 net income compared with $571 per cow.[3]

There is a longer history comparing pasture based systems than with organic and there has been extensive studies with over 100 dairy farms of varying sizes in Wisconsin and New York that show consistently high net income from grass based dairies. A three-year study conducted in Wisconsin from 2000 to 2002 consistently showed that grass-based dairies, despite lower milk production per cow, had a higher net farm income from operations compared to confinement dairy operations.[4] Other key findings from the study include:

- In Wisconsin and New York, graziers were more profitable per cow and per hundredweight equivalent (cwt) than their confinement counterparts in these states.
- Farms using managed grazing consistently showed higher net farm incomes from operations per cwt and lower costs per cwt than traditional and large modern confinement farms in Wisconsin.
- Farmers who switch from confinement dairy farming to managed grazing need not suffer financial hardship during the transition.
- The average grazing dairy farm with less than 100 cows was more profitable per cow and per cwt than those with over 100 cows. Lower labor costs account for much of this advantage.
- Graziers are making a variety of strategies work for them. Some graziers use a seasonal calving strategy, some are certified organic, and some use milking parlors. No single approach seems to be the right or only way to manage a grazing dairy farm.

Kathie Arnold, an organic dairy farmer from Truxton New York sent a testimonial to the Massachusetts task Force in July 2007 which includes the following: *My husband, his brother, and I have been in partnership for over 27 years in Central New York. We did our first Cornell Dairy Farm Business Summary (DFBS) in 1988 at which time we were doing okay financially, but certainly much was left to be desired. After a few years of the DFBS, we thought we could do better if we took our fresh cows and high cows off pasture and just fed them in the barn. Our herd average was already around 23,000 pounds per year at that time. We did see a little*

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[3] Intensive Grazing Farms 2004 Cornell University – September 2005
[4] *Pastures of Plenty: Financial Performance of Wisconsin Dairy Farms*, Tom Kriegl and Ruth McNair, UW-Madison, 2005.

increase in milk production with this change but it was also accompanied by greatly increased purchased feed costs and more herd health issues. By 1993, we had enough of the mostly confinement dairying and the very high feed bills that went along with it and decided to move to intensive grazing management, giving the cows a new piece of grass after every milking. We converted our best ground, which happens to be near the barn, to pasture. While that first year of intensive grazing was a learning year for both the cows and for us, our herd health had improved, the bottom line was looking better over the course of the year, and our milk production had dropped only about 500 lbs per cow. By the end of the second year of intensive grazing, we were seeing significantly increased profitability, which has carried on since. It gave us the cash flow to buy more nearby land as it became available (perhaps at a much cheaper rate than MA land) and from 1995 to now, we doubled our herd size from the original 70 cows to 140 cows.

In 1998, we transitioned our herd to organic production and that led to another bump-up in profitability. I have not done the DFBS every year since we have been organic but have done it 3 out of our 8 finished years of organic production. Looking at our rate of return for all capital (without appreciation) does show a difference in profitability for the 4 management regimes we have had since 1988:

1988-1990—low intensity grazing: 4.2% return on all capital
1991 & 92—mostly confinement: -.35%
1993 (a transition year to intensive grazing): 1.4%
1994-1997—intensive grazing management: 7.2%
1998, 99, & 2006—organic: 12.4%

The savings in operating costs quickly outstrip the investment needed and this has been confirmed by numerous studies comparing grazing and non-grazing herds. 36 studies are listed in the appendix of this document, most all showing higher net income on grazing farms and lower veterinary and medicine cost than on non-grazing farms (studies from OH, CA, VT, WI, VA, NY, MI, PA, MO, and MA).

Attachment A: **Profitable Grazing-Based Dairy Systems –** USDA NRCS May 2007
Attachment B: **Wisconsin's Grazing Success: Grazing dairy farms show profit and promise** Center for Integrated Agricultural Systems • UW-Madison College of Agricultural and Life Sciences • February, 2005

2. **What are the effects on consumer prices by the changes in the Proposed Rule?**

The future of the organic milk market relies on consumer confidence that they are getting the product they are led to believe by manufacturer's marketing—with a large share of organic milk cartons showing pictures of cows on pasture. This Proposed Rule provides the NOP the ability to enforce standards which producers have been asking for and consumers expect.

The realities of competition in the marketplace dictate the retail price for organic milk rather than the producers cost of production. In order to provide a more detailed explanation to how the retail price is set and the question about the effect on consumer prices of any changes in production costs, we need to understand what impacts the consumer price.

How does the organic milk market work?
In the conventional market, the price that farmers get paid for their milk is strictly defined by the Federal Milk Marketing Order (FMMO), and roughly reflects the demand for wholesale milk in its many manufactured forms. Prices rise if there is a shortage but fall dramatically in times of domestic or worldwide surplus. Historically, organic milk prices have reflected the farmers' need for a stable income and living wage. It has always been difficult to assess the true cost of providing a steady supply of high quality, organically certified milk. There are many different methods of production; different family demands; different needs for ensuring transition to the next generation; and different requirements to service debt or to obtain a long-term return on capital.

At this time, there are many companies who purchase raw organic milk in significant quantities. Some of the larger companies are HP Hood LLC, WhiteWave Foods (Horizon Organic), Upstate Niagara Cooperative, Natural By Nature, Humboldt Creamery, Clover Stornetta, Dairy Farmers of America, Organic Valley Family of Farms, Lancaster Organic Farmers Cooperative (LOFCO), Organic Choice, Pastureland Cooperative, Organic Dairy Farmers Cooperative (ODFC), Dairy Marketing Services (DMS) and Dairylea. These companies either purchase milk on behalf of processors or process it themselves. Some farmers sell directly to small manufacturing or processing companies, such as yogurt or cheese processors. Farmers contract directly with companies that have brands in the market place such as Horizon, HP Hood and Organic Valley or to handlers like DMS who sell to manufacturers. Initial negotiations with transitioning farmers are between the individual farmer and either the end user of the milk who have a brand in the market (Horizon, Hood, and Organic Valley) or another handler. Initial contracts are usually for 2 years. Farmers are paid through one of the existing cooperatives (for example: DFA Inc., Dairy Lea, LOFCO, Mount Joy Farmers Coop, NFO, ODFC, St Albans Coop Creamery) or LLC's (Agri-Mark; Agri-Services, LLC; Dairy Marketing Services).

The ownership of the purchasing companies varies from farmer-controlled cooperatives with a board of farmers, for example: Organic Valley, LOFCO, Upstate Farms, Humboldt Creamery, ODFC to a Limited Liability Company like HP Hood and Organic Choice to a national company with shareholders like WhiteWave Foods, a subsidiary of Dean Foods.

How is the farmgate price set?
1. Not by Government - Organic milk is neither directly subsidized nor supported and its farm gate price is not set by the federal government, despite the fact that all processors, with the exception of Aurora Organic Dairy, pay into the federal pool.
2. Not by the retail price - The farmgate price bears no relationship to the retail price, which is set by supermarkets based on competitive wholesale pricing between processors, in-store promotions and an average margin of 31% for their operating expense and profit. The same ½ gallon of milk can vary by as much as $2, retail price, within a 5 mile radius.
3. Not as a percentage of retail price - In most years, organic dairy farmers receive a smaller percentage of the consumer dollar than the conventional farmer, 34% for organic compared to 41% for conventional (based on a farmgate price of $15 and a retail gallon price of $3).

4. Not by Parity Pricing - Parity price[5] for November 2008 was $41.20 (up $.50/cwt from Oct. '07) for Midwestern milk; with regional premiums added to that, bringing it up to about $45/cwt in the Northeast.
5. Not by comparison to conventional dairy - Conventional farmgate prices rose by as much as $10 per cwt in 2007 and dropped by the same amount in 2008 without any reaction in the organic farmgate price,
6. Not by supply and demand - Consumer demand for organic dairy is still growing by 10-15%- slightly down from the previous 25% a year from 2005-2008, while family farm organic dairies are losing money and returning to conventional production.
7. Not by national negotiation - Most contracts are with individual farms except those that are contracting with Dairy Marketing Services, and a majority of producers have confidentiality clauses.
8. Not by costs of production – Farmers have received little increase in their pay price[6] despite rapid increases in production expenses such as:
    a. Increases in the price of purchased feed (both grain and hay) by between 50-110%,
    b. Increased costs of diesel fuel (essential for powering tractors to make hay and grow corn),
    c. Increased costs of petroleum based products such as plastic for protecting hay from winter weather,
    d. Increases in cost of liability and property insurance, land taxes, property and equipment maintenance, labor costs and health insurance.
    e. Increases in the cost of labor.

The average "farmgate price" (what farmers receive) is $1.20 per ½ gallon. Producers are paid a base price for their milk plus a dazzlingly array of incentives and bonuses including: regional bonuses, market premiums, seasonal bonuses, volume bonuses, butterfat and protein bonuses, profit sharing, signing bonuses and quality bonuses.

Despite the fact that there are many independent companies buying milk from farmers, they are all offering approximately the same amount for each 100 pounds of milk (the unit for which farmers sell their milk) on a regional basis and they tend to raise their prices by the same level at the same time.

Table 1 illustrates the uniformity of pay price offered by different companies in the New England region. The three companies used as an example are the major purchasers of organic milk in the northeast.

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[5] The Agricultural Adjustment Act of 1938 states that the parity price formula is "average prices received by farmers for agricultural commodities during the last ten years and is designed to gradually adjust relative parity prices of specific commodities".

[6] Despite requests from individual farmers and farmer organizations like NODPA and FOOD Farmers, organic dairy farmers received no increase on their base price from January 2006 to December 2007, with the exception of one company that gave a small cost of living increase. From January 2008 to December 2008 organic dairy farmers have received an average increase in their farmgate price of 9% based on their December 2007 price. That is an average of 3.8% per calendar year, approximately 8¢ per gallon per year for the period January 2006 to June 2008.

Table 1: Overview of pay-price in New England

	Horizon Organic		Organic Valley*		HP Hood	
	2006	**2008**	**2006**	**2008**	**2006**	**2008**
Base price	24.00	25.00	26.00	27.00	26.00	24.90
MAP	2.00	1.25			-	2.00
Short (2 to 4 months)	1.50	3.00		**	2.00	2.00
Long (8 months)	0.75	1.50				
Trucking charge/yr	-	-	$900	$900	-	-
Average year round price***						
Long program	26.50	27.25				
Short program	26.50	27.25	26.00	27.00	26.50	27.40

How is retail price for organic milk set?

It is set very simply by competition for supermarket shelf space and the retail price of organic milk varies by as much as $2 per ½ gallon depending on where it retails and which brand it is sold under. There are many in-store promotions that can lower the price in order to gain market share.

With the growth of demand for organic dairy products, there has also been an increase in store brand (Trader Joe's, Whole Foods 365 brand) and private label (Safeway's O Organic) brands which has had a dramatic affect on retail price for organic milk. How does store brand milk affect the pricing of organic milk and the profitability of family farmers?

- Store brand milk is either packaged for the individual chain store as in the case of Organic Valley packaging milk for Whole Foods 365 brand or as branded product that is only promoted at the store, for example Aurora Dairy in Colorado packages Nature's Promise ½ gallons for Stop and Shop or the Woodstock brand which is packaged by Schroeder Company in Minnesota and sold in Stop and Shop.
- The informal survey from western Massachusetts shows that store brand milk will average lower than the branded product, such as in Stop & Shop Nature's Promise sold at $3.59/ ½ gallon and the Organic Cow and Stonyfield brand sold at $4.19 / ½ gallon, a difference of 60¢.
- Many of the major companies will package store generic brands for different retailers so the store brand is a significant sector of their business, as is the case with Organic Valley and Whole Foods. In Whole Foods the 365 brand retails for $3.29 / ½ gallon and Organic Valley retails at $4.19 / ½ gallon, the same milk, packaged in the same plant but with the store brand selling at 90¢ less than the Organic Valley brand milk. Similarly with HP Hood who packages the Full Circle generic brand sold in Big Y and the Stonyfield brand, with the generic brand retailing at $3.98/ ½ gallon and Stonyfield brand at $4.85/ ½ gallon, a difference of 87¢ for the same milk from the same plant but in a different package.
- In an economic recession, it is generally assumed that more consumers will purchase store generic brand products. Organic is no exception to this, so the influence of store brands will be felt more strongly by the national brands during the upcoming year.

- There is not enough data yet to know at what point higher prices will deter consumers from purchasing organic milk and there has not been any consumer resistance to purchasing ½ gallon of organic milk at $4.50.
- Dairy buyers for the major retailers are not as experienced in the marketing of organic milk and tend to follow the same criteria they use for non-organic milk, price cutting and in-store promotions. They are experienced in encouraging competition among suppliers of store brand milk and national brands for the shrinking space in the retail dairy case. In these highly competitive situations, the generic organic milk is able to lower its price because it has no marketing overhead which will force the national brands to lower their price to compete. While this is good for the consumer, it creates an unsustainable situation for dairy processors and ultimately family farmers who do not have the savings and extensive lines of credit to fund competition between large companies. If this situation continues we will see the demise of the smaller, organic dairy family farm and an increase in the large organic dairies that can produce organic milk cheaper because of economies of scale.

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How does the farmer benefit from changes in the retail price and what is the farmer's share of the retail dollar?

- The consumer pays anything from $2.89 to $4.69 for a ½ gallon in the store.[7]
- The average retail price for a ½ gallon in June 2008 is $4.02[1], which is an increase of 58¢ from May 2005. The increase that farmers have received during the same period is 29¢ per ½ gallon.
- The farmer receives 30% of the average retail price. The percentages that are allocated to the retailer, distributor, processor and brand owner varies depending on brand, store policy and store location.

3. How will changes in the Proposed Rule affect the supply and availability of organic feed?

The changes in the Proposed Rule will have a very limited effect on the supply and availability of organic feed. The availability and the price for organic feed are more directly affected by price and availability of conventional feed. There is currently a shortage of supply for organic feed because of two main reasons:

a) The high price for conventional grain and forage at Spring planting in 2008, which gave no incentive to produce organic feed or grain, or transition to organic production. With corn being sold for $8 a bushel there was no incentive to grow organic corn even when the price rose to $12 a bushel. The conventional corn price has subsequently dropped, not because of demand from livestock operations but because of trading in commodities and the ethanol market.
b) In 2007 there was an estimated 40% increase in the organic dairy herd because of the resolution of the Harvey lawsuit and the subsequent deadline from NOP to stop the 80/20 provision for transitioning to organic dairy; the low price in the conventional market and the rapid increase in the pay price for organic dairy farmers because of a shortage of organic milk in 2006-2007. The 40% increase in organic cow numbers increased the

[7] This data has been informally collected in western Massachusetts for 3 years from 3 Stop and Shop stores, 2 Big Y stores, 3 consumer co-ops, one Whole Foods and one Trader Joe's store

demand for organic feed which the organic grain producer could not immediately respond to because the transition to organic production for crops is 3 years, rather than the 1 year for organic dairy. The demand from organic dairy was compounded by a rapid increase in organic poultry operations that were feed intensive, resulting in a shortage of supply and a rapid increase in price.

There are two parts of the rule that could affect the demand for and consequently the availability of feed:

a) A minimum of 120 days on pasture during the grazing season and the consumption of a minimum of 30% dry matter from that pasture: The Proposed Rule mandate on the amount of feed organic livestock needs to obtain from pasture will only affect those dairies that have limited or no access to productive pasture as the majority of organic dairies currently meet and exceed the required 30% dry matter from pasture during the grazing season. These dairies tend to be larger operations and their demand for purchased feed would drop slightly because they would be getting more nutrition from pasture. While there are no numbers for how many cows this would affect, the recent non-compliance action by the USDA NOP on Aurora Dairy because they were not satisfying these criteria indicates that this provision would affect their 12,000 cows. Aurora has stated that they could not presently meet the 30% requirement without reducing their stocking rate which averages 5 cows to the acre currently.
b) No exemption from access to pasture and the provision of 30% dry matter from pasture for finishing organic beef during the grazing season: Organic beef operations are currently being allowed by most certifiers to finish their beef in confinement. The NOP have said that this is not permitted and have not allowed any exemption in the Proposed Rule. If beef cattle cannot be confined for finishing, the time it takes for them to reach the required conformation may possibly be increased by up to 6 months on some operations which will require more feed. Organic meat is relatively small and a less developed category than the organic dairy sector (2% and 16% of total organic sales respectively), but it is the fastest-growing sector of the organic industry, (29% growth rate)[8] which make it difficult to estimate the effect on the supply of organic feed.

4. Are current feed stocks limiting the expansion of organic livestock production?

In 2008 there has been a shortage in supply of organic feed for the reasons stated above in bullet point 3. With the shortage the price rose dramatically as shown in Table 1 and Table 2 below.[9] The unexpected increase in price plus the increase in the price of fuel with no subsequent increase in pay price caused a dramatic slow down in the number of dairy herds transitioning to organic and existing dairies expanding their herds. While the availability of organic feed may be a limiting factor in the transition to organic by conventional dairies, many of whom have traditionally fed mostly purchased feed, the cost of the grain and the low pay price has been a far more significant factor in producer's decisions as to whether to transition to or expand their organic livestock operation. The increase in the cost of feed has caused more organic livestock producers to look at more efficient ways to use their pasture and to experiment in growing more forage crops or small grains.

[8] Organic Trade Association's 2007 Manufacturers Survey.
[9] USDA AMS Livestock and Grain Market News

The publication of a Final Rule on Access to Pasture will provide producers with the confidence in the long term integrity of the Organic Seal to further invest in pasture improvement.

Table 1: Upper Midwest Organic Feed prices for 2007 and January to September 2008

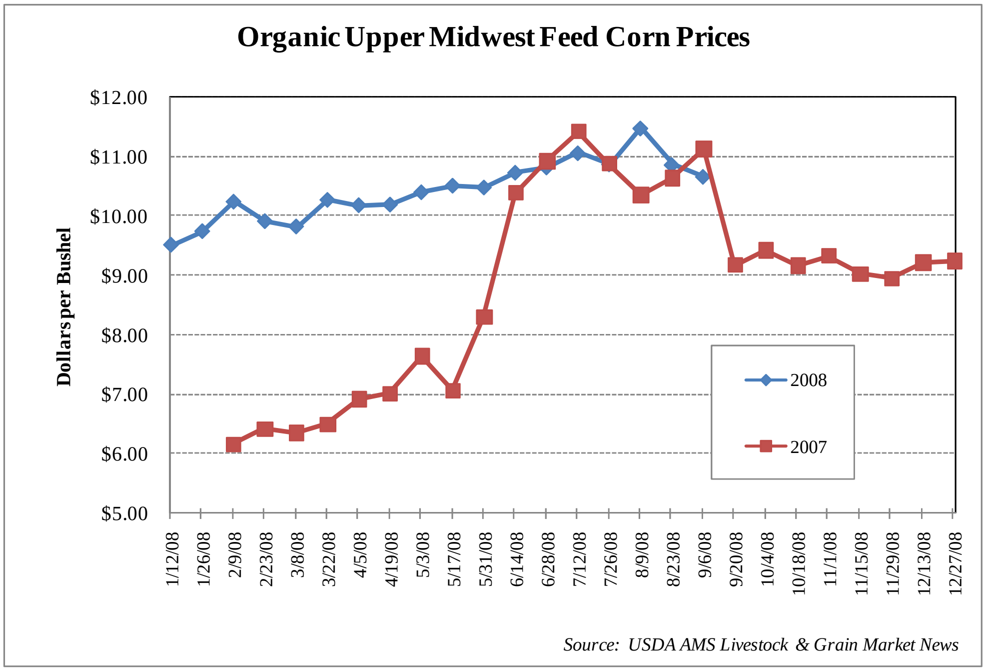
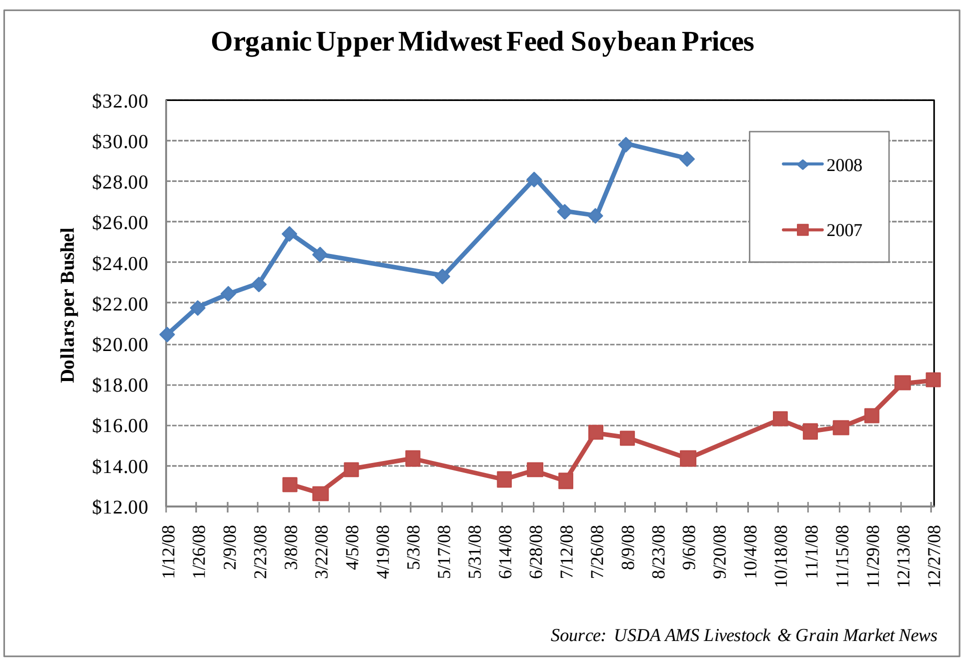


Table 2: Upper Midwest Organic Soybean Prices 2007 and January to September 2008



5. What are the increased costs from increased recordkeeping, fencing, land and seed to meet the requirements of the Proposed Rule?

- The Proposed Rule if implemented as written would have imposed some increased cost for recordkeeping for some operations that are not already using the calculation of dry matter as prescribed in the Proposed Rule. The recommendations made by FOOD Farmers and many others is to make the calculation of dry matter less prescriptive and allow the certifier and producer to agree on an accurate method of calculation that can be integrated into the existing management of the operation. We believe that it is already required that organic livestock operations provide their certifiers with complete information on rations for all livestock groups; feed raised, sold and purchased; and that, based on the provided information (confirmed by audit trail and inspection) certifiers should have the expertise to determine whether or not 30% DMI is provided to the various livestock groups during the grazing season of the particular area, which should not be less than 120 days. If the FOOD Farmers recommendation is followed and certifiers provide adequate forms and documentation to simplify the process, there will be little or no increase in the time spent or the cost of recordkeeping.

- The Proposed Rule, if implemented as written, would have imposed some increased cost for fencing, especially for those producers who are unable, or unwilling, to obtain cost share towards improving or adding fences in marginal land, wetland and streams. In many areas, EQIP or other federal cost share funding dollars are limited and farms with smaller numbers of livestock often do not receive the high priority ranking that larger farms do, nor would it be likely that all the waterways on a farm could be fenced at once through cost sharing to come into compliance with the proposed rule. Thus, if all streams and waterways are required to be fenced out, there could be a significant financial burden on some farms that have numerous waterways. Fencing of waterways in range systems would be prohibitive because of the large acreages needed per animal because of low yield in ranges. If the FOOD Farmers recommendations are followed there will be very limited increase in fencing costs as the majority of producers already have operations that already maximizes their return from pasture and have already installed the necessary fences. For those operations that do not pasture their cows to meet the 120 day/30% DMI minimum requirement there will be an increase in fencing costs to lay out a paddock system in order to provide adequate grazing. Except for those operations that have little or no grazing, there will not be a significant cost involved in fencing pasture.

- There should be no increase in cost of seed for those that have already been following a pasture plan to meet the intent of the organic regulations. For those that haven’t, they might have significant expense to reseed pasture and other land to develop productive grasses, but it may be no more than they would have spent on their crop for mechanical harvest on the same land were it not converted to pasture.

There should be no need for producers to purchase or rent more land if they are already following a pasture plan to meet the intent of the organic regulations. For those that have either a high stocking rate or insufficient productive pasture to meet the 30% DMI requirement from pasture during the grazing season, they face a choice of reducing cow numbers, renting/buying more land, changing their management to increase pasture and crop productivity, moving some classes of animals off the farm to more distant pastures, or a combination of these. Many farms with limited land base send their heifers to pastures away from the milking facility to leave the close by pastures for the lactating herd. The minimum amount of pasture that this rule mandates is not overly burdensome for organic dairies to meet and is required to meet the intent of the organic regulation.

6. How will costs decline if ruminants increase time grazing compared with being fed grain or harvested forage?

Cornell's Dairy Farm Business Management Studies consistently show that grazing dairies have lower per cow costs in many areas: purchased feed, vet and medicine, machinery and crop costs, and other dairy costs.[10] Because pasture is usually grazed at a more immature stage than if the crop is mechanically harvested, the feed quality is typically higher for pasture than stored forage, resulting in the ability of the farmer to reduce grain feeding, especially the expensive protein portion.

Because the animals are on pasture most of the time during the grazing season, electricity and fuel usage is reduced because there is less manure handling and less running of fans and feed handling and harvesting equipment. Less bedding is needed. There are reduced repair, operating, and capital costs for harvesting equipment because the livestock are doing the harvesting for whatever portion of their diet comes from pasture. Grazing-based systems have also been found to lower the costs for animal care and replacements by prolonging the working life of the cow, significantly reducing the annual cull rate.

Data from the 2005-2006 Cornell University, Dairy Farm Business Summaries indicates that on New York State dairy farms where technically sound systems of grazing management were implemented in conjunction with the recommended guidelines for supplemental feeding and livestock management, the net income per cow without appreciation averaged $386 per cow/yr higher than on farms where grazing was not utilized or utilized but not well-managed, that is $957 net income compared with $571 per cow.[11] A three-year study conducted in Wisconsin from 2000 to 2002 consistently showed that grass-based dairies, despite lower milk production per cow, had a higher net farm income from operations compared to confinement dairy operations.[12]

Attachment A: Profitable Grazing-Based Dairy Systems – USDA NRCS May 2007
Attachment B: Wisconsin's Grazing Success: Grazing dairy farms show profit and promise Center for Integrated Agricultural Systems • UW-Madison College of Agricultural and Life Sciences • February, 2005
Attachment C: Cornell's Dairy Farm Business Summary Measuring The Impact of Pasture for New York's Dairy Farms

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[10] Cornell's Dairy Farm Business Summary Measuring The Impact of Pasture for New York's Dairy Farms

[11] Intensive Grazing Farms 2004 Cornell University – September 2005
[12] *Pastures of Plenty: Financial Performance of Wisconsin Dairy Farms,* Tom Kriegl and Ruth McNair, UW-Madison, 2005.

Attachment A: Profitable Grazing-Based Dairy Systems – USDA NRCS May 2007

United States Department of Agriculture

Natural Resources Conservation Service

May 2007

Technical Note No. 1

Profitable Grazing-Based Dairy Systems

Issued May 2007

Acknowledgments

Numerous people have provided source information, as well as expert reviews and comments. Their contributions are acknowledged and very much appreciated. This publication is intended to support and encourage the start-up of grazing-based dairy farms across the Nation whether they are organic or "conventional." With the interest in grazing-based dairies on the rise, this publication is timely. It is a helpful guidepost to those wanting provide their dairy cows fresh pasture for as long as their growing season permits. As an editor recently stated in a grazing magazine, pasturing dairy cows is conventional when we look at the long history of dairy farming here in the United States and the World. It has been a brief moment in history that we have confined dairy cows and hauled everything to them that they eat.

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Profitable Grazing-Based Dairy Systems

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Profitable Grazing-Based Dairy Systems

Introduction

This technical note provides background and general guidance on the concept of grazing-based dairy systems, defined as land management systems that seek to *optimize* dairy production through grazing. As a companion technical note to the Natural Resources Conservation Service sustainable agriculture tech note series, it focuses on associated economic, environmental, and social benefits.

Well-managed grazing-based dairies help protect soil, water, air, plant, and animal resources by maintaining dense vegetative cover on the soil, increasing soil organic matter, improving the distribution of nutrients on fields, and reducing the potential for odors, spills, or runoff from concentrated animal waste storage areas. Compared with traditional confinement dairies, grazing-based dairies harbor more wildlife, more diverse plant communities, and healthier cows with longer productive lives. In addition, grazing-based dairies often boost income by reducing feed, labor, equipment, and fuel costs. Less tractor time frequently increases leisure time or allows for expanded farmer enterprises. Grazing-based dairy systems also provide a lower-cost option to help some small family farms survive without expanding their business, or start dairying with less debt incurred.

This technical note has three parts. Part I defines grazing-based dairies and describes their ecological, social, and economic benefits. It may be of greatest interest to those wanting to know about the advantages and disadvantages of grazing-based dairy systems. Part II describes the considerations involved in developing or making the transition to a grazing-based dairy. It may be of greatest interest to those who have decided on grazing, but want more information on what is involved. Part III is a series of case studies from different parts of the country. Interest in individual case studies may depend on the geographic location of the individual reader.

Part I

Background

While dairy farming is undergoing rapid expansion in arid environments across the country, the overall number of dairies and dairy cows has decreased, but the number of cows per farm has increased. Dairy farm profits are increasingly affected by urban encroachment, rising land costs and taxes, and industry pressure to use the latest milk production technologies. Production per cow and total production have increased more rapidly than demand for milk, keeping pressure on dairy producers either to improve or to get out of the business. Nutrient management regulations to improve water quality are increasing the cost of manure handling. Recently, air quality constituents, such as odors and particulates, associated with confinement and manure storage facilities have come under more scrutiny, as well. Meanwhile, long-term average milk price trends have remained static, whereas short-term milk prices are unpredictable, often falling to unprofitable levels for several months during a production year.

As profitability of dairy farms declined in the 1980s and 1990s, it was common for managers to expand herd size, attempting to maintain or increase net income. As demand for feed and forage increased on a fixed land base, confinement systems seemed to be the appropriate response. However, dairy farmers soon found that large, confined herds required large waste management systems, greater housing investments, and more feed storage and handling equipment. After investments are made, the dairy manager often feels financially "locked in" to a confinement system, and thus, a cycle of ever-increasing herd size to spread fixed costs and increase net income continues.

Grazing-based systems are alternatives to highly capitalized systems of equipment, storage, and housing infrastructure. Grazing systems rely on two primary resources: pasture, the lowest cost source of feed available (Soder and Rotz 2001), and the dairy farmer's management skills. Because the cow ingests the standing crop, all intermediate steps required to feed the cow are eliminated during the pasture season. Forage reaches the rumen in high quality condition. Less purchased feed and manure handling is required. Fewer acres need to be harvested as stored forage.

Some time is shifted to moving herds and portable fences in rotational pastures. Yet, with well-designed layout of lanes and field divisions, this can be done in minutes rather than hours. Some time must also be devoted to honing skills on feeding supplements to pastured dairy cows, maintaining standing forage quality, and consistently providing enough forage throughout the grazing season.

What is a grazing-based dairy system?

Grazing-based dairy production systems that focus on specific application of grazing principles and practices are a subset of grassland agriculture. Grazing-based dairy production systems are broadly defined as *land use and feed management systems that optimize the intake of forages directly harvested by grazing cows*. This is in sharp contrast to confinement-based dairy systems, which are broadly defined as *land use and feed management systems that optimize milk production with confined cows consuming harvested forages.* Both systems generally use feed supplements to balance the dietary ration.

Grazing-based dairy systems are not "one size fits all." Landowner objectives, soil types, forage species, livestock genetics, land base, and climatic conditions differ from farm to farm. Production methods and management practices vary among farms, within regions and across the continent. Thus, while all grazing-based dairy farms share the common objective of optimizing the intake of forages harvested through grazing, differences in application are often necessary and appropriate.

The characteristics for an efficient, productive grazing-based dairy system are listed below. They focus on practices that optimize livestock performance (whether milk production or live-weight gain), pasture quality and dry matter yield, and the efficiency of forage utilization.

- Lactating animals are pastured using a rotational stocking method where the whole herd grazes a fresh paddock at least every other day and leaves an adequate forage residual (stubble) for optimal forage regrowth. Many graziers provide fresh paddocks after each milking.
- Lactating animals are stocked on pasture at least 75 percent of the grazing season (time of year when adequate grazable dairy forage supply and quality are present). Dry cows and heifers are stocked on pasture at least 90 percent of the grazing season.
- During each grazing season, lactating animals obtain at least 50 percent of their forage intake through grazing. Meanwhile, dry cows and heifers obtain at least 90 percent of their forage intake through grazing.
- Water is provided to the herd in the paddock in which they are grazing or in the laneway near the paddock.
- Paddocks are sized every rotation cycle to provide enough on-offer forage for adequate livestock intake during their time on each paddock while keeping adequate forage residual to maintain stand vigor and desired species composition. A back fence prohibits access to just-grazed paddocks while a front fence limits how much fresh, ungrazed grass is made available to the cows.
- Adequate, stabilized laneways are provided for ease of movement between milk parlor and paddock.
- Fields are sized and laid out so that forage on-offer is sufficient to meet grazing herd demand at all times throughout the grazing season. Fields are also designed for ease of mechanical harvest when needed to remove maturing forage in excess of herd demand during the current rotation cycle.

Pasture and pasture use

Pasture is fundamentally different from other livestock feed crops in three principal ways:

- It must be fenced.
- It is used while actively growing or standing.
- It is harvested by livestock.

Fencing is essential to successful pasture-based livestock feeding. Fences define areas of "feed" so that the dairy manager can ration the amount of forage provided to the livestock. Most systems have permanent perimeter fencing and single-strand, portable interior fences.

Dairy pasture differs from all other feed crops in that it is used while it is alive and actively growing (fig. 1). Consequently, it can change in quantity and quality on a daily basis, losing quality if allowed to get too old before being grazed. Pasture also changes in quality as the growing season progresses. Other feeds are generally harvested and preserved or conserved near or at full maturity and then fed to animals in measured amounts and qualities. Pasture also can be fed in measured amounts by estimating forage dry matter production and sizing a paddock accordingly to feed the herd for the length of the planned stay. However, pasture is generally harvested before maturity, when it is vegetative and very high quality. Pasture has no loss of dry matter by respiration and no shatter, leaf loss, or loss of quality by spoilage or rain damage that generally accompany perishable, stored forage production procedures despite efforts to reduce such losses.

Finally, pasture is harvested by livestock. Animals are the harvesting machines, but unlike mechanical machines they choose what and where they harvest and where they deposit animal wastes. These choices affect forage utilization and manure distribution. Cows shun urine and dung spots and unpalatable plants and plant parts. They often return the nutrients in manure to the pasture in a nonuniform pattern if shade, permanently placed water troughs, mineral feeders, or hay bunks are present that cause them to linger near those areas.

Grazing-based dairy pasture:
A unit of fenced land with productive soil that is managed to provide high quality forage for lactating dairy cows, replacement heifers, or dry cows as a significant portion of their diet throughout the pasture growing season.

Manure distribution in intensive dairy grazing management can vary in warm versus cool weather (White et al. 2001). However, a structured grazing and clipping system can cause animal grazing to mimic closely the uniformity achieved by mechanical harvest and nutrient application. Cows are also extremely efficient harvesters. They leave behind forage that they neither desire nor need. Typically, this includes more mature forage. Grazed forage is usually less mature than mechanically harvested forage. This selectivity cannot be achieved by machines that harvest the good and the bad above the cutter bar.

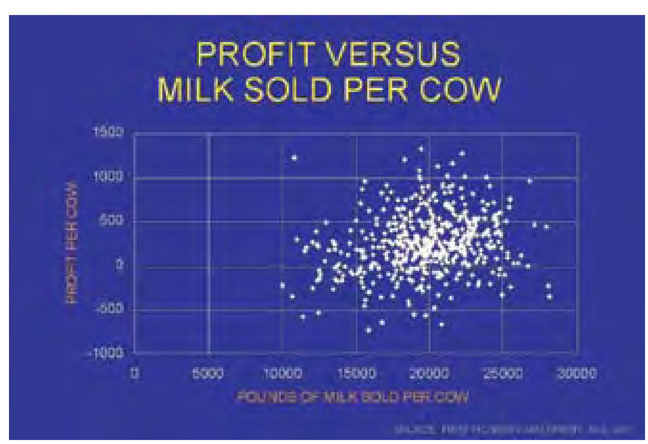
Grazing-based dairy systems require the simultaneous management of a forage production system, a livestock production system, and a forage harvest system. The grazing-based dairy replaces high input costs of a confinement dairy with the managerial skill of the grazier to ration high quality pasture well throughout the grazing season. Understanding forage plant growth patterns and responses to grazing is critical for effective management.

Characteristics of grazing-based dairy system

Dairy producers and supporting businesses and agencies often use milk production (rolling herd average) as the primary indicator to assess the economic success of various practices or systems. Despite the popularity of this indicator, the apparent correlation between milk production and net profit is weak (fig. 2), and its use is often misleading. In fact, it is possible for dairy

Figure 1 A healthy dairy pasture, note legume content

Figure 2 Profit as a function of milk sold per cow



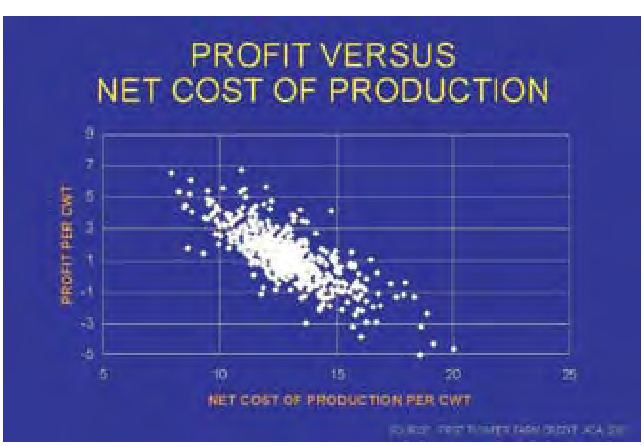
producers with high rolling herd averages to go broke (Smith et al. 2002). A much better indicator is net farm income from operations (NFIFO) per cow or net cost of production per hundred-weight (CWT) of milk produced (fig. 3).

Many grazing-based systems intentionally forgo maximum milk production to meet family and lifestyle goals. Even so, cases exist where grazing-based dairy herds exceed 20,000 pounds of milk per cow per year, and some individual producers routinely report herd averages of 24,000 to 26,000 pounds of milk per cow per year. Some grazing-based dairy herds are still quite profitable producing 15,000 pounds of milk per cow per year or less (Kriegel 2000). As shown in figure 3, dairies with the lowest cost of production generate the highest net profits. Using grazing-based systems can significantly reduce production costs.

Obstacles to grazing-based dairy systems

The greatest obstacle to the adoption and use of grazing as the central part of a production system for dairy cows may be custom and culture. Over the past 40 years, most dairy producers abandoned grazing-based systems for confinement-based systems to maximize milk production. As a result, confinement dairying is the only system many producers know. In spite of high debts and low profit margins resulting from increased mechanization and facilities costs and low milk prices, farmers are reluctant to try a grazing system and learn how to operate it. A mistake farmers sometimes make is to prolong the decision to switch to a grazing-based system until their debt margin is too great to be easily overcome, even with improved profitability.

Figure 3 Profit as a function of net cost of production



Other obstacles, real or imagined, include:

- Physical location of the barn or milking facility in relationship to the cropland that could be used for improved pasture. For example, it is too far for the animals to walk, or there are intervening physical barriers such as roads or watercourses.
- Good management skills are necessary, and new skills are needed. This requires the ability to adapt and the desire to learn.
- The concept of "optimum" milk yield versus "maximum" milk yield can be a tough sell given the dairy industry's tendency to equate high milk yield producers as the most successful dairy managers.
- Former confinement herds placed on pasture must become adapted both genetically and behaviorally to grazing. The genetics takes time.
- The kind of necessary equipment changes, resulting (sometimes) in the misconception that more equipment is needed and older equipment is being underused.
- Balancing rations with grazing selectivity and changing pasture quality throughout the season requires more attention to both the pasture and the animal.
- Herd size is too large for the land base. There is not enough available or potential pastureland to support the herd for the full length of the grazing season.
- Features or characteristics of the climate or land base (rough, broken terrain, wet soils, heat and humidity, periods of drought, or prolonged wet or cold weather) prevent efficient pasturing of dairy cows.
- A misconception persists that pastures are low yielding and, therefore, inferior to row and hay crops as a land use. This often results in managers relegating pastures to marginal lands and not improving them nor managing the grazing of them, thus ensuring poor yields and risking long-term sustainability.
- Forage base is not suitable in the short term to meet the quality or quantity requirements for dairy production. Fields that have been row-cropped or in hay production for many years take time and management to become densely grassed, highly productive pastures.
- Some or all paddocks lack a water supply. Developing a water system requires up-front capital, but some Farm Bill programs may provide cost-share assistance for water development.

- Farmers may also be concerned about the labor needed to move portable troughs, but moving these smaller troughs can be a part of the cattle moving routine.
- Current debt load requires consistent income to service debt. The producer cannot tolerate drops in milk income that might occur by switching to grazing either completely or partially while learning the tricks of the trade.

A good rule of thumb for grazing-based systems is that at least an acre of productive pasture is required for each lactating cow. This ideal acre would be within 1 mile of the milking facility or closer in hot weather. Typically, herd size is only limited by the ability of the soil to yield forage adequate to meet the requirements of the herd. Grazing-based herds of 200 cows or fewer are common, 500 are less common, and 1,000 or more cows are rare. Some producers use portable or low-cost, stationary milking facilities to handle pastures and tracts of land that are more remotely located from the main milking facility.

Lower milk production associated with grazing-based herds is the most frequently cited reason that some dairy producers do not adopt this system. The rationale does not necessarily consider both costs and return, however. Milk production levels at less than maximum can produce greater economic returns if costs are reduced significantly, as has been observed by some dairy graziers and economists. It really is more realistic to consider the optimum milk production level that will return the best economic results over input costs.

What are the benefits of this system?

This system of dairy farming provides more options than confinement dairy systems. Since grazing cows can produce milk at lower cost than confinement systems, grazing-based dairy farmers have a lower cost base, allowing for retention of a higher percentage of gross income in contrast to confinement farms. Producers can also try alternative forage crops to extend their herd's grazing season into fall or winter, or earlier into spring than is typical for their climate. Because less overall labor is required, farmers can spend leisure time off the farm, develop more efficient milking parlors, or pursue other income-providing or value-added enterprises that complement the dairy system.

Perhaps the greatest benefit to well-planned and managed grazing-based dairy systems is that they become more sustainable. This is achieved through a mix of practices that combine social, environmental, and economic advantages. Table 1 summarizes the ecological and social benefits of well-managed, intensive grazing systems. Further discussion of the social, economic, and environmental advantages follow.

Social advantages

Dairy farmers often cite improvements in quality of life as one of the greatest benefits when switching from confinement-based to grazing-based dairying. It still takes time and work to operate a grazing-based dairy, but the kind of work and amount of time changes. Labor involved in growing and harvesting forage and grain crops is reduced or eliminated and is replaced by labor to maintain fences and watering sites and to move cows. In fact, many people report they have more time to spend with family, or doing things other than routine essential confinement-based dairy chores (Ostrum and Jackson-Smith 2000).

Grazing-based systems can help young people become interested in and stay content with the lifestyle of dairy farming by reducing the long hours of hard work common to confinement systems. Start-up costs are also lower for grazing-based systems. This can eliminate a significant problem for young people with little equity to purchase a herd, acquire basic equipment, and rent or buy a farm.

Local communities and rural landscapes also benefit from family-sized grazing-based farms. These farms are more likely to recirculate agriculturally generated dollars locally to support the local community. Large, confinement dairies buy in bulk from the lowest bidder and often use outside businesses for their supplies, bypassing the local economy.

Rural landscapes with cows in pastures tend to be more appealing as tourism grows in importance in various regions of the country such as in the Northeast (fig. 4) and parts of the West. As an example, Whatcom County, a rural county in northwest Washington State, is dominated by small dairies, but ranks fifth in the state for visitor spending. Tourism, according to the Bellingham/Whatcom County Visitor's Bureau, directly creates 6,560 jobs, or 6 percent of the employment in the county in 2006 (Bellingham/Whatcom County 2006).

Economic advantages

Grazing-based dairy systems achieve an economic advantage primarily by using homegrown perennial forage crops. Perennial forage crops are long-lived feed sources whose establishment costs can be spread out over many years. Their yields may be

Table 1 Social and ecological benefits of intensive grazing systems

Feed Source	Poorly managed pasture	Confinement feeding					Well-managed pasture
		Greenchop	Corn silage	Alfalfa hay	Grass hay/haylage	Grass silage	
Ecological/social effects							
Human time	Little time devoted to managing herd	Planting, harvest, storage, and daily feeding required	Planting, harvest, storage, and daily feeding required	Multiple harvest, storage, and daily feeding required	Multiple harvest, storage, and daily feeding required	Multiple harvest, storage, and daily feeding required	Moving and maintaining temporary fences and watering systems and moving cows required
Animal health	Animal stress, soil ingestion, parasite ingestion possible	Confinement: hoof and leg problems, acidosis, udder health, animal stress possible	Confinement: hoof and leg problems, acidosis, udder health, animal stress possible	Confinement: hoof and leg problems, acidosis, udder health, animal stress possible	Confinement: hoof and leg problems, acidosis, udder health, animal stress possible	Confinement: hoof and leg problems, acidosis, udder health, animal stress possible	Improved leg/foot/udder health and less parasite ingestion and climatic stress
Soil quality	Compaction, erosion, reduced OM, reduced permeability likely	Wheel compaction when soils are wet	Reduced OM, erosion, reduced permeability, compaction	Compaction when soils are wet	Compaction when soils are wet	Compaction when soils are wet	Increased OM, compaction minimized, little to no erosion
Nutrient cycling	Nutrient hot spots. Nutrient deficiencies elsewhere. Nutrients may exceed plant needs on long-term overstocked pastures	Close fields tend to receive more nutrients. Higher use of commercial fertilizer due to nitrogen losses in confinement operations and often inefficient collection, storage, and utilization of manures	Nutrient uptake not uniform throughout growing season. Close fields tend to get more nutrients. Higher use of commercial fertilizer due to nitrogen losses in confinement operations and often inefficient collection, storage, and utilization of manures	Close fields tend to get more nutrients. Manure not often applied since it can be harmful to alfalfa stand maintenance. Requires commercial fertilizer applications instead, unless preceding crop receives excess manure	Close fields tend to get more nutrients. Nutrients used throughout the growing season. Higher use of commercial fertilizer due to nitrogen losses in confinement operations and often inefficient collection, storage, and utilization of manures	Close fields tend to get more nutrients. Nutrients used throughout the growing season. Higher use of commercial fertilizer due to nitrogen losses in confinement operations and often inefficient collection, storage, and utilization of manures	Nutrients in balance with plant needs. Nutrients used throughout the growing season. Good nutrient distribution
Perennial characteristics	Most are perennial, but annuals tend to invade. Re-establishment often needed	Frequent reestablishment of some species required	Reseeded annually	Re-established every 3-5 years	Periodic reestablishment of perennials. Annuals reseeded yearly	Perennial, but may be in a crop rotation with corn or other crops	Most are perennial. Occasional, optional reestablishment or overseed necessary
Water quality	Runoff and loss of sediment, nutrients, organics, and pathogens likely	Confinement: Water collection and management, manure storage, manure distribution, and nutrient management required to protect water quality	Confinement: Water collection and management, manure storage, manure distribution, and nutrient management required to protect water quality. Silage leachate potential rapid depletion of dissolved oxygen	Confinement: Water collection and management, manure storage, manure distribution, and nutrient management required to protect water quality	Confinement: Water collection and management, manure storage, manure distribution, and nutrient management required to protect water quality	Confinement: Water collection and management, manure storage, manure distribution, and nutrient management required to protect water quality. Silage leachate potential rapid depletion of dissolved oxygen	Water quality maintained with adequate buffers as needed

Table 1 Social and economic benefits of intensive grazing systems—Continued

Forage production	Less than soil potential; unpalatable or low producing species increase. Quality high on close grazed pastures. Spot grazed or zone grazed pastures have variable quality	High quality but more variable than other harvested forage. Lower production than other harvested forage. Stand loss occurs sooner	Good quantity, quality dependant on harvest and storage conditions	Good quantity, quality dependant on harvest and storage conditions	Good quantity, quality dependant on harvest and storage conditions	Good quantity, quality dependant on harvest and storage conditions	Generally high quality but slightly lower quantity than mechanically harvested forage
Air quality – odor	Fresh manure less offensive than stored manure. Manure build up around haybunks and near shade	Confinement: Concentrated animals and stored manure produce strong odors	Confinement: Concentrated animals, stored manure, and silage effluent produce strong odors	Confinement: Concentrated animals and stored manure produce strong odors	Confinement: Concentrated animals, stored manure, and silage effluent produce strong odors	Confinement: Concentrated animals, stored manure, and excessive silage effluent produce strong odors	Fresh manure less offensive than stored manure. No manure buildup
Energy – fossil fuel	Significant supplemental feeding or return to confinement required. Manure spreading energy costs are low. Futile reseeding efforts take energy	Energy costs associated with tilling, planting, harvesting, fertilization, manure spreading, etc., are higher than for grazing systems	Energy costs associated with tilling, planting, harvesting, fertilization, manure spreading, etc., are higher than for grazing systems	Energy costs associated with tilling, planting, harvesting, fertilization, manure spreading, etc., are higher than for grazing systems	Energy costs associated with tilling, planting, harvesting, fertilization, manure spreading, etc., are higher than for grazing systems	Energy costs associated with tilling, planting, harvesting, fertilization, manure spreading, etc., are higher than for grazing systems	Electric fencing required. ATV often used to move fencing, waterers, and cows. Some energy used to clip, harvest excess forage, and fertilize fields

reduced during years of less than ideal growing conditions, but they generally still provide a product without the annual costs of establishment. Annual crops, on the other hand, must be planted or seeded every year, requiring an annual outlay of cash for fuel, equipment use, labor, pesticides, fertilizer, and seed. These costs generally must be paid back with a single year's production, often a difficult task when the weather refuses to cooperate, sharply reducing yields or crop quality. In other years, insects or disease may reduce the yield or eliminate it. When crop production falls short, feed must be purchased. This dramatically increases the cost of milk production, because money is spent twice, first on a short crop and second on feed purchased to replace the reduced or failed crop. However, annual crops used wisely can complement perennial forage species to improve overall dairy cow performance, or grazing efficiency on some farms, particularly during transitions as perennial pastures are renovated.

Economic studies have demonstrated that well-managed grazing-based dairy systems tend to have higher net incomes per cow than similar sized confinement-based farms (Winsten et al. 1996; Cornell Dairy Farm Business Summary 1996–2000; Kriegel 2000, 2003). These increased economic benefits are primarily related to lower overall production costs, including crop production costs such as the following:

- labor, machinery and fuel to plow, plant, and harvest
- fertilizers, pH remedials, pesticides, and herbicides
- transport and storage costs

Figure 4 Rural landscapes with cows in pastures tend to be more appealing where tourism is important.

On most dairy farms, these crop production inputs account for 25 to 30 percent of the total costs of production (Ford and Hanson 1994; LaDue et al. 2000). Total feed (purchased and homegrown) costs run about 50 percent (Ford and Hanson 1994).

Any significant reduction in input costs will most likely improve net farm income. The amount of forage that has to be mechanically harvested, placed into storage, and then fed back out of storage is reduced by one day for every day that the cows harvest their own feed through grazing. This generally amounts to at least 5 months, depending on growing season length. It can be profitable to extend the grazing season by widening the mix of forage crops by planting cool- and warm-season grasses and forbs that grow or maintain their quality when other forage crops are dormant or low quality.

Grazing-based systems can also lower the costs for animal care and replacement. Cows tend to be healthier and have longer productive lives when they can get fresh air, eat high quality feed, walk more, are less stressed from milk production demands, and get off concrete or "dry" lots. Cows not pushed for maximum milk production tend to breed back more quickly and have fewer reproduction problems. As a result, cull rates and overall veterinary expenses are lower on grazing-based rather than confinement farms (Muller et al. 2002). Grazing-based dairies can also earn additional income by selling higher value springing heifers rather than cull cows, because fewer cows are culled. Alternatively, if they so desire, these dairies can more easily build herd numbers because they have more springing heifers than needed as replacements. However, seasonal calving grazing-based dairies may not enjoy reduced culling rates or fewer reproduction problems. Their cows must all breed back ideally in a narrow 60-day period, so they will calve in the same narrow time frame.

The collective and compounding advantage of reducing all of the production costs is what makes grazing-based dairy production profitable across many geographic areas.

Environmental advantages

Properly managed, intensive grazing systems can benefit soil quality, nutrient cycling, water quality, air quality, energy conservation, and wildlife and animal health (fig. 5).

Soil quality—Indicators of soil quality, including soil erosion, soil compaction, soil tilth, and soil organic matter content, improve when cropland is converted to pasture. The continuous vegetative cover provided by well-managed perennial pasture virtually eliminates soil erosion. This contrasts with erosion on poorly managed pasture that is sometimes only marginally better than cropland. Erosion occurs in abused pastures where plant cover is thin, and along streambanks where livestock have direct access and are not provided with off-stream water or shade.

Well-managed grazing systems can cause dramatic improvements to soil quality from organic matter or soil carbon accumulation. This contrasts with row crops, especially such crops as corn silage that return little in the way of root or aboveground biomass to the soil. In the southeastern United States, converting tilled cropland back to grassland increased soil carbon about 3.5 percent per year for up to 40 years until a higher soil carbon stability level was reached (Conant et al. 2000). Owens and Hothem (2000) found higher levels of soil carbon in pastures than in no-till cropland on the same soil types after 20 years.

Soil tilth is the physical structure of the soil that allows movement of water and air and plant root growth with the least restraint. Tilth is significantly improved with increased soil organic matter and decreased tillage, both direct results of conversion from a row crop based system to a grazing-based dairy system.

Nutrient cycling—Nutrients are effectively cycled onsite in well-managed grazing systems. Between 75 and 80 percent of the nitrogen consumed by grazing dairy cattle in feeds and forages passes through them and is returned to the pasture (Whitehead 1995). High producing dairy cattle on pasture are typically fed supplemental forages and concentrates to balance their diet. But the nutrients brought into the system

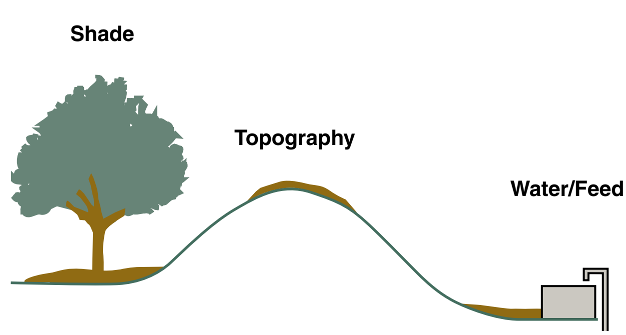
Figure 5 Properly managed intensive grazing systems provide many environmental benefits.

tend to match or exceed the nutrients going out through milk production, creating a balanced system and making frequent fertilizer additions unnecessary. This is a clear advantage over hayland or cropland where most nutrients in the harvested crop leave the field and must be replaced with manure or inorganic fertilizer to maintain fertility levels. Between 70 and 90 percent of the phosphorus, potassium, calcium, and magnesium consumed is also excreted back onto the pasture (Mott 1974).

Confinement systems, which do not necessarily balance the number of cows they support with the land base available, are likely to import far more nutrients than the growing crops need, especially if manure is applied in addition to recommended fertilizer applications. This nutrient imbalance can lead to accumulation of phosphorus and potassium in particular. Excess potassium in the soil can lead to problems with plant growth and animal health. Excess phosphorus can lead to water quality problems.

While grazing-based systems are usually superior overall in nutrient cycling, management of the pasture system determines individual success because distribution of nutrients on pastures will be uneven if left unmanaged. In intensive dairy grazing systems, manure deposition is highly correlated with the amount of time spent in various areas (White et al. 2001). In areas where animals congregate, dung and urine spots disproportionately concentrate (fig. 6). In fact, the rates of nitrogen (N) application at urine spots can range from 200 to 900 pounds per acre (Barnes et al. 1995; Whitehead 1995; Stout et al. 1997). Intensive rotationally stocked pastures have a more even distribution of nutrients than continuously stocked pastures (Mott 1974). In either case it is extremely important to space water, feeding areas, salt and mineral boxes, and shade frequently and evenly on a rotational pasture so that animals are not inclined to loiter routinely in small, isolated areas.

Figure 6 Effect of preferential animal movement on manure distribution



Water quality—Erosion is minimal on healthy pastures. In general, sediment transport to water bodies is reduced as permanent pasture replaces tilled cropland. This does not, however, mean that nutrient loading to water bodies is reduced, since surface applied manure and urine nutrients may leave pastures during runoff events in overland flow. Factors that influence whether pastures will reduce nutrient loss to water include:

- stocking density/plant cover
- animal distribution
- rainfall intensity and duration
- water balance
- soil infiltration/percolation characteristics
- amounts and timing of surface applied fertilizer
- proximity to surface water

Pastures typically need fewer chemical applications than do annually tilled row crops. This reduces the potential for chemical pollutants to enter surface or ground water. Grazing-based systems have reduced risk of accidental animal waste spills since there are fewer or smaller manure collection, storage, and disposal facilities. Finally, these systems are not as subject to pollutant loss as are confinement areas and crop fields that receive recent unincorporated, high-rate applications of manure just before transport or runoff events. Where less manure storage is required, better application procedures, including application timing, are possible.

Air quality—Odors associated with fresh manure and silage effluent can be reduced on well-managed pastures as compared with poorly managed pastures or confinement systems. On well-managed pastures, animals tend to herd less, so there is less potential for concentrated manure areas to develop from which strong odors can arise. Manure and undigested feed decompose more rapidly in aerobic conditions found in pastures. In confinement systems, wet, accumulated waste can intensify the odor problem. The co-mingling of urine and dung in confinement systems increases ammonia volatilization. Ammonia combines with other chemicals in the air to form a regulated particulate (Tyrell 2002).

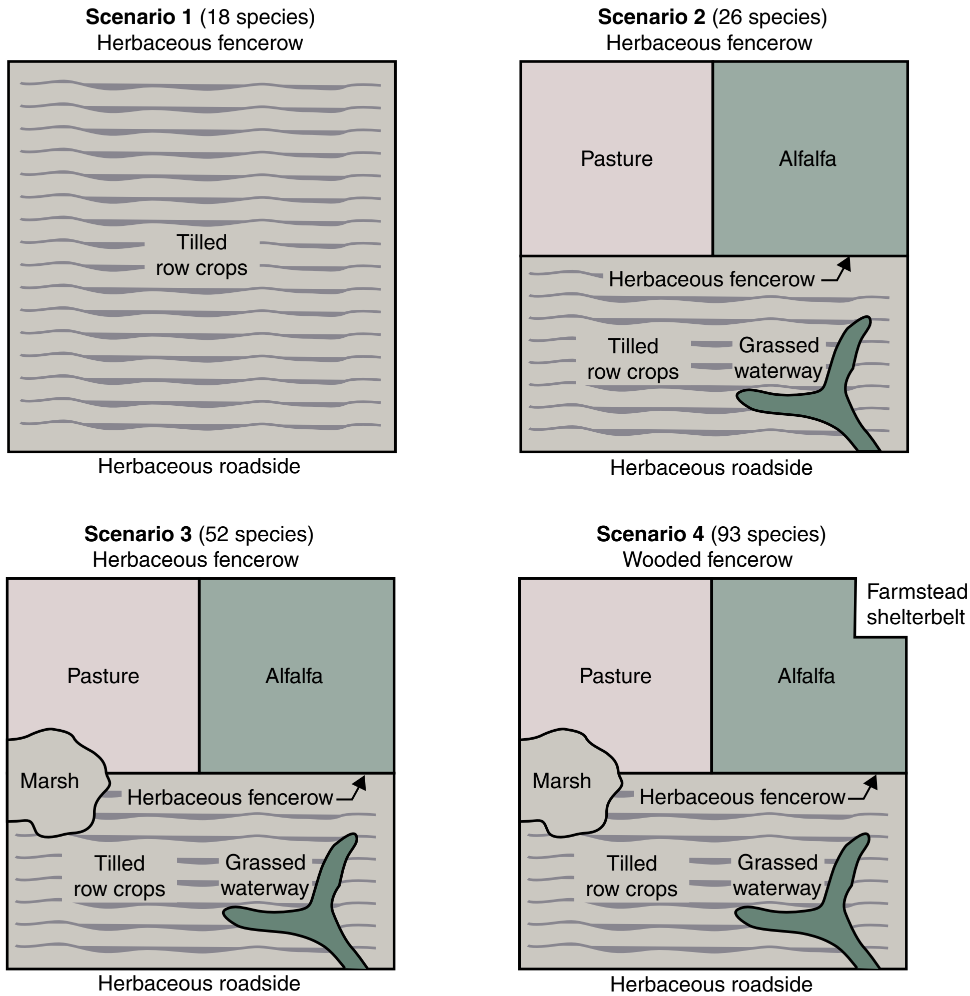
Energy conservation, wildlife and animal health—Under well-managed grazing systems, energy costs associated with tilling, planting, harvesting, fertilization, and manure handling are dramatically reduced. The handling of manure may be reduced from daily collection and spreading to once a week or less during the grazing season.

Pastures along with woody perennials can add an element of landscape diversity to row-cropped land. Wildlife that use grassland habitat or edges between land cover types are favored. Figure 7 shows how songbird numbers increase as pastureland and other perennial habitats are restored on a quarter section of farmland (Best et al. 1995). The perennial nature of most well-managed pastures reduces the need for soil disturbance and external chemical inputs. The diversity of soil flora and fauna also increases because of increased organic matter and decreased soil disturbance and farm chemical inputs.

Finally, a grazing-based system has marked advantages for animal health when compared with confinement. Dry cows get more exercise, which can facilitate calving ease and easier transition to lactation (fewer metabolic health issues). Hoof and leg problems, acidosis, udder sores, mastitis, and general animal stress associated with confinement are largely alleviated under pasture, although some animal health issues remain and new ones emerge. For example, under pasture, the potential increases for animals to ingest parasites. Also, if shelter is not provided, excessive heat or cold may cause stress. On the other hand, pastured cows exercise while they eat and walk to and from the milking parlor, allowing them to maintain better overall physical condition than cows in confinement. As a result, grazing-based animals remain productive over more lactations compared with cows kept in confinement systems.

Landscape-scale impacts—Grazing-based dairies are valued for their appearance in the landscape and often enhance regional tourism economies. The aesthetically pleasing and nostalgic characteristics of traditional barns, silos, open pasture, and tidy farmsteads attract visitors to a dairy area. These landscapes become even more valuable as larger, industrial appearing confinement dairies replace smaller dairies.

Figure 7 Effect of agricultural landscapes on nesting bird species (modified from Best et al. 1995)



These four agricultural landscapes (scenarios) represent a range from an intensive row-crop monoculture to a diverse mixture of crop and noncrop habitats. Each illustration is intended to represent a quarter section (160 acres) of land. The maximum number of nesting bird species is given in parentheses.

Who should implement a grazing-based dairy system?

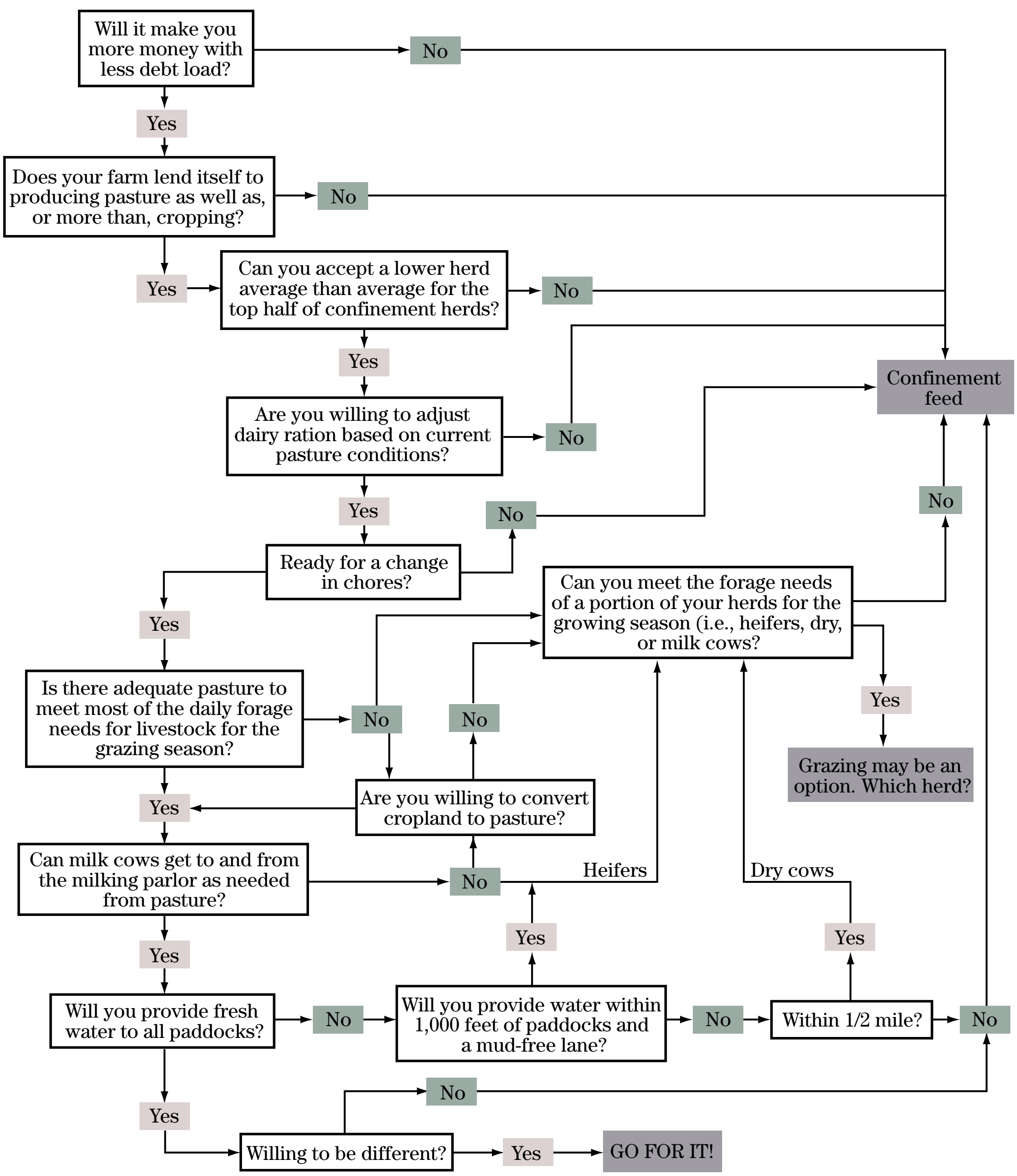
Despite many advantages, a grazing-based system is not for all dairy farmers. Figure 8, based on a list of questions developed by the Cooperative Extension Service in New York, Iowa, and Wisconsin, provides a schematic of a thought process for determining when intensive grazing is an appropriate system for a given dairy. If the answers lead to consideration of a grazing-based dairy system, the farmer should contact the local USDA, NRCS, Conservation District, Cooperative Extension office, or a private consultant to explore available options or alternatives for solving resource problems and increasing profitability.

Question: Is it really hard mentally to go from confinement production to the grazing level?

Answer: No. If you have the mental capability to excel or fail with one system, you can do it with another, as well.

Lance Johnson, **Hesperia, MI**

Figure 8 Is intensive grazing for you?



Part II

Considerations for implementing a grazing-based dairy system

Economic considerations

Farmers need to clearly understand their economic goals, whether they propose to start up a dairy or remain in the dairy business. How many hundredweight of milk are needed to produce the desired net return to meet principal and interest payments and other costs of running the farm? For the start-up grazing farm, this analysis may be simple because investment can be limited at the outset to purchase only the absolute essentials in equipment, cows, and land to get started. It may mean renting for a while to keep capital costs down. Existing confinement dairy farms that carry holdover debt from machinery and facilities, may find transitioning to grazing more difficult. However, selling unneeded machinery, equipment, and other items can help lower debt principal, making payback easier.

Another economic consideration will be the transition from cropland to pasture. This transition requires substantial time and reinvestment in fences, forage seed, lanes, and watering facilities. Whatever the case, planning for the possibility of low milk prices that would make it difficult to meet all cash flow needs is imperative. Then, determine what other outside income sources are available to meet this low milk price contingency. Farm expenses must be satisfied before discretionary family living expenses. A planning horizon of at least 3 years is needed to project income, expenses, and cash flow if major changes are to be implemented.

Marketing—A marketing strategy is essential for economic success when starting or changing to a grazing-based dairy business. Some fundamental questions to consider are:

- What kind of milk market is already in the area?
- Can you sell to either the fluid milk market or a processing milk market?
- How many processors within hauling distance are willing to buy and pick up your milk?
- On what basis is the milk priced (butterfat, solids, protein, and volume)?
- Are specialized milk market opportunities available for milk produced in a pasture-based system?

Direct marketing may be an option for some. It may use much of the extra time gained by going to a grass-based system. A “people-focus” is required to win over a customer base and keep them happy and returning. Another skill set, licenses and permits, and additional equipment must be acquired to process the milk into the product to be sold. Direct marketing also requires taking some level of risk as it goes against the established, consolidated milk industry that is specialized in function. A misstep in direct marketing can be costly.

Sustainable Agriculture Technical Note 2, Marketing Tips for Sustainable Agriculture, provides a variety of references that may help you develop a marketing strategy for your dairy. It can be found electronically at *http://policy.nrcs.usda.gov/media/pdf/TN_SA_2_a.pdf*.

Transition period—All economic aspects of a changeover must be considered when attempting major shifts in production and operations. Once the decision to change has been made, a set of transition actions and considerations should be prepared. Needed actions include:

- Improving the milking facilities so that more cows can be milked in a shorter time.
- Improving pasture fertilization by soil testing and following recommended fertilizer rates.
- Keeping fixed costs low—avoiding the purchase of expensive farm machinery without careful analysis.
- Rationing pasture forage based on estimated herd dry matter intake for the grazing period used, quantity of standing forage presented to the herd within the paddock, and a nutritional analysis of forage samples collected from pastures throughout the season.

Seasonal calving, a potential modification to a grazing-based dairy, can be a successful venture, but there are many aspects to consider before making such a move. Transition from confinement to grazing is a major step, and switching to seasonal calving at the same time would not be advisable. Consider the following when embarking on a seasonal calving operation:

- Plan to transition the lactating herd into a seasonal calving herd so that it can provide cash flow to meet debt payments. For example, it may mean prolonging the lactation period of some cows and delaying their being bred back to get all the cows on the same breeding schedule. Also, some breeds and individual cows within breeds may be difficult to maintain in a seasonal system because of lower estrus detection and fertility (Washburn et al. 2002)

- Milk production will be much lower during the transition.
- Will the processor accept milk when the amount of milk supplied daily is more variable?
- Facilities and labor must be available to feed and care for all of the newborn calves simultaneously. Additional laborers may be needed to handle all the cows calving at once.

Ongoing evaluation—Another factor in achieving desired economic goals is ongoing evaluation of changes and analysis of how these changes affect performance outcomes. Some of the more important evaluation tasks include:

- keeping good production records and using a reliable accounting system to track farm performance, preferably on an enterprise-by-enterprise basis
- monitoring quality and quantity of milk produced by its measurable constituents
- monitoring forage quality regularly and adjusting rations accordingly
- monitoring animal health
- monitoring pasture growth at least weekly in all paddocks
- establishing a good advisory team (e.g., veterinarian, nutritionist, economic consultant)

Animal-plant interactions

Grazing animals and pasture plants have co-evolved over time. This plant-animal co-evolution occurred in an uncontrolled setting, however. Once grazing animals are enclosed in a pasture, it is essential to plan stocking densities so that the animals do not undergraze or overgraze the plants. If too densely stocked, desirable grasses are overused and can weaken and die out. Chronic overgrazing leads to a dominance of unpalatable and/or low-yielding species. If under stocked, little-grazed or ungrazed areas may appear as random patches or in less accessible places or more distant places from water. These areas become less productive and even less desirable over time because of invasion by taller plant species and the presence of standing dead residue that shade and slow new shoot growth, causing further livestock avoidance. Good pasture management ensures that both the animals and the grass prosper.

Animal nutritional requirements—Under United States economic conditions, dairy cows are usually supplemented with concentrates for optimal milk production (fig. 9), whether they graze standing forage or eat stored forages (Peyraud et al. 1999). Most United States herds will not reach their genetic potential to produce milk on a grazed grass-only diet (Mayne 1998) without supplemental rations to account for nutritional deficiencies and changes in the quantity or chemical constituents of the grass being grazed. Optimal amounts of supplements for grazing dairy cows may vary by farm and across seasons within a farm. Methods to gauge the quality of the ration balance include the following:

- Testing the forage frequently to monitor changes in quality across seasons, weather conditions, and forage species and maturity. Send forage samples to a nearby certified forage-testing laboratory. Check this Web site: *http://www.foragetesting.org/.*

Figure 9 Under United States economic conditions, dairy cows are usually supplemented with concentrates in a mixed ration for optimal milk production.

- Monitoring milk production and constituents to see how cows are responding to changes in diet quality and climatic conditions. For instance, monitoring milk fat production to ensure the herd is ingesting enough effective fiber for cud chewing.

Applying proper supplementation strategies requires experience. New producers and those thinking about substantial grazing-based dietary changes should work with an animal nutritionist familiar with pasture ration building to ensure the optimal ration balance for the dairy herd at all times.

Forage species selection—Proper selection of forage species is needed to ensure that forage is high quality and highly digestible. Guidelines for selecting forage species follow:

- Use a mix of disease-resistant varieties of forage species (4–5, includes legumes) adapted to local soils and climate that will produce adequate forage on-offer during each grazing period throughout the grazing season.
- When different desired forage species do not grow well together because of competition or maturity differences, grow them in separate pastures.
- Use seasonal pastures if forage species can be chosen that grow best at different times of the year and the number of grazing days can be extended by doing so.
- Use species with the best regrowth potential during the grazing season. Offer the cows 80 to 100 pounds of forage dry matter per cow per day in the paddock at turn-in (Muller et al. 2002).

Animal selection—Dairy graziers need to select the best artificial insemination (AI) bulls. Bull genetics can be evaluated using the following Animal Improvement Programs Laboratory (AIPL) Web site: *http://www.aipl.arsusda.gov/*, and then clicking on **Active AI Lists** or **Top Bull Lists**. A bull's predicted transmitting ability (PTA) values are useful for predicting daughter performance on pasture (McAllister 2002). The only exception for this is the PTA for milk fat. Grazing herds can have significantly lower average milk fat percent and milk fat production than confined herds. PTA fat is, therefore, a poor predictor of a sire's daughter fat production in grazing herds (Weigel and Pohlman 1998). Another Web site for selecting AI sires is *http://www.dairybulls.com/*. This Web site identifies bulls by specific trait, background, and location.

Reproductive traits are important for seasonal calving (Washburn et al. 2002). Cows must conceive as a group (within 60 days) so that a 12-month calving interval is maintained and all cows can be dried off at the same time. Seasonal graziers may benefit from using the USDA productive life (PL) and daughter pregnancy rate (DPR) trait information at the AIPL Web site, by either clicking on **Active AI Lists** or **Top Bull Lists** and going to the **PL** and **DPR** columns for each bull of interest. Another good indicator is estimated relative conception rates (ERCR) now at the AIPL Web page: *http://www.aipl.arsusda.gov/eval/summary/ercr.cfm*.

Generally, dairy graziers, seasonal or not, need to select animal traits that allow for high dry matter intake, ease of gain, survivability, and the relationship these factors have on timely breed-back. However, before deciding on the crossbreeding option, read the McAllister paper in its entirety and gather more facts. Crossbreeding needs to be done with care. Cows with a high genetic trait to produce over 66 pounds of milk daily during early lactation (Sayers 2001) often fail to breed back easily on pasture. If not supplemented well, their feed intake becomes too low to maintain weight, thus they lose too much body condition to conceive at first or second service. Success with a sire is measured by having daughters with good milk yield that have been successfully rebred on grazing-based dairies (Mayne 1998). This technique requires patience because it will be 3 years before the outcome is known with a first calf milk-producing heifer.

Paddock layout and design

For lactating dairy cow herds, paddock systems should be set up to efficiently strip graze fields. Strip grazing involves using movable front and back fences so that new forage is offered to the herd after each milking. The pasture itself works best as a rectangle about a quarter mile wide with a lane lengthwise through the middle (fig. 10). With this configuration, the paddocks on either side do not extend beyond 660 feet from the lane to the perimeter fence. This ideal set-up keeps the distance to water in each paddock relatively short. However, other configurations can work where terrain and farm boundaries do not allow for the most efficient setup. The animals are watered from a portable trough moved with each move to fresh grass. The water is furnished to the trough through convenient coupling attachments from a pipeline traveling along the lane.

Another advantage of this layout is its suitability for cutting and harvesting excess forage. With only two permanently fenced subdivisions and a laneway, forage too mature for grazing can be easily cut and harvested for later use with a minimum of turns. The pasture field(s) should be allocated to ensure that just enough vegetation is cut so cows will not be grazing overmature forage at times or regrazing paddocks where forage is too immature and short at other times.

The following design considerations are effective in installing long-lasting serviceable laneways:

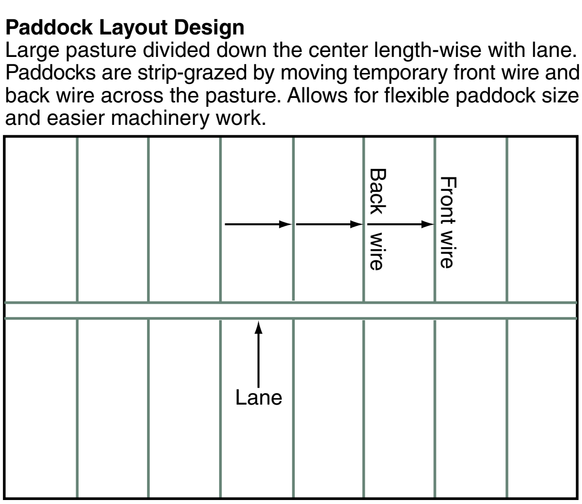
- Construct laneways with a relatively flat grade, but allow some elevation change for drainage along the length. Side-to-side drainage can be achieved by crowning the lane or using graded deflectors to collect water and redirect it into a stable grassed area (fig. 11).
- Harden steep or heavily used laneways. A layered, compacted composite of filter fabric cloth (bottom layer), coarse stone or gravel, and fine granular material (top layer) are typical components (fig. 12).
- Maintain laneways regularly to avoid trail ruts that can deliver sediment, nutrients, and bacteria to nearby waterbodies.
- Make sure the topcoat material of laneways is foot-friendly and does not bruise or injure feet.

Water distribution

A single, fixed watering site should be avoided when distance to water is greater than 800 feet. Multiple, dispersed water sites ensure that lactating dairy cows do not spend too much time in laneways. Excessive travel time:

- degrades laneways and gate openings
- increases the potential to move nutrients and other pollutants offsite

Figure 10 Hypothetical paddock layout design



- increases the potential for nutrient transfer to those areas not needing additional nutrients
- reduces milk production by depressing water and forage intake (cows at a watering facility are unlikely to return to the paddock if far away or during hot weather)
- increases the amount of energy used by the animal for nonproductive activity (walking to/from water), energy otherwise devoted to foraging or lactation

The equipment necessary to hook up a portable water trough is readily available and inexpensive. A pressurized delivery system is best for portable troughs. Troughs should be kept full at all times to keep cows well watered and prevent them from overturning them. Install a pipeline to serve all paddocks. Pipelines can be laid on the soil surface at the lane fence if polyethylene water tubing is used. Burying in a trench is preferred to deliver cooler water and reduce maintenance. However, burying involves a long-term commitment to the layout as it is now. Do not restrict flow by using a narrow diameter pipe. Winterize as needed.

Figure 11 Water bar design

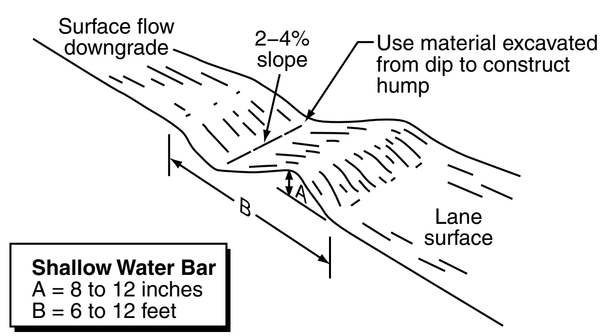
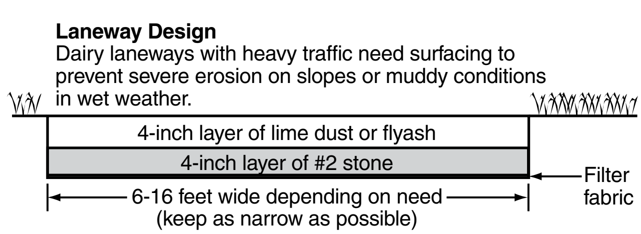


Figure 12 Laneway design



Pastures with live streams in them should have an alternative livestock watering facility to decrease livestock visitation to the streambed and banks. Ideally, these pastures should also be isolated as a separate treatment unit and grazed less intensely, and only under firm soil conditions. This sharply reduces problems associated with water contamination from bed and bank erosion, as well as from manure and urine. Water in ponds and streams can be of questionable quality. An improved stream crossing may be necessary when cows must cross the creek in a streamside pasture or gain access to a set of pastures flanking either side of a stream. Livestock ponds should be fenced and an appropriate grassy buffer established between the fence and pond's edge. If pond water must be used to water livestock, use a siphon hose or gravity flow pipe to convey water to a trough outside the pond fence. These actions improve water quality for receiving bodies and often improve herd health by reducing the transmission of water-borne diseases and parasites through direct udder contact or ingestion. This can contribute to the production of higher quality milk and a healthier herd.

Avoiding environmental problems

Soil compaction is perhaps the most serious resource concern that can occur because of livestock on poorly managed pasture. Compaction can occur wherever cattle tread on moist soils. It increases runoff, reducing plant-available moisture, (Dickerson and Rogers 1941), and reduces soil pore space, making root penetration and nutrient uptake more difficult (Hodgson 1990; Gradwell 1965; Tanner and Marmaril 1959; Kok et al. 1996). However, rotationally grazed pastures are less likely to be compacted by cattle traffic than continuously grazed pastures in that they limit access of dairy cattle to a small area at any one time and are vacated between rotations and during the dormant season (fig. 5). Cropland soil compaction often occurs from wheel traffic on moist soils. This compaction can penetrate deep into the soil and be difficult and expensive to correct. Soil compaction by livestock traffic is most severe at the surface, but can extend 1 foot into tilled soil of annual forage crops (Krenzer et al. 1989).

Streambank and shoreline erosion accelerated by livestock can be prevented or remedied by

- providing alternative watering sites
- controlling the grazing duration and leaving a higher stubble
- providing abundant forage outside the immediate banks
- providing shade away from the stream
- providing cattle watering ramps to water's edge
- improving stream fording areas
- fencing off sensitive (or easily disturbed) areas to control or prohibit access

Managing overall plant growth

All effective grazing systems require a grazing plan. Knowing when to start grazing a paddock based on estimating dry matter production and monitoring grass growth helps the farmer determine when the paddock will be ready to be grazed again. There must be enough paddocks to complete the rotation cycle so that the first-grazed paddocks are ready for regrazing.

When forage plants are experiencing high growth rates, excess pasture can be machine harvested and stored. This extra output is crucial during periods of low forage production, such as mid-summer for cool-season species pastures or where freezing weather or drought causes forage production to cease. During periods of slow growth, additional paddocks are required so that a rotational cycle can be lengthened to a maximum of 40 to 42 days to ensure sufficient regrowth while maintaining forage quality. If the current and projected weather might prevent sufficient regrowth, then stored forage can be fed along with pasture to maintain intake.

Monitoring forages

Grass growth should be monitored and recorded in a log at least once every 2 weeks. For the greatest accuracy, forage should be measured in the paddock just vacated and the paddock to be occupied. Take several measurements on each paddock using a ruler, pasture stick, or rising plate meter (fig. 13). These measuring devices must be calibrated to convert height into forage dry weight. Experienced graziers can often

Figure 13 Monitoring forage regularly is important for determining the number and size of paddocks needed and proper feed ration for the herd.

estimate forage production by eye, but it is useful to calibrate the eye with field measurements from time to time. Forage from several random small areas of known size may be clipped, dried, and weighed for accurate yield determination. Visual checks may be inadequate for changes generated by climate or soil conditions because grass stands change in composition and thickness over a grazing season.

Complete records should be kept by individual paddock even when strip grazing. This information can be used to predict in advance how many paddocks are needed and how big they should be.

Monitoring forage quality through regular testing (at least every 2 weeks or when forage species or quality is noticeably different) aids in formulating a proper feed ration. Proper ration balancing is needed to keep milk flow and constituents at their best for the season and lactation cycle of the herd.

Monitoring animals

To keep grazing cows at the body condition score (BCS) appropriate for the portion of the lactation cycle they are in, their BCS must be monitored throughout the cycle. Body condition is extremely important at breeding to keep the cow on a 12-month calving cycle. Using the dairy cow BCS scale of 1 to 5, they should freshen (calve) with a BCS of 3+ to 4– (Wildman et al. 1982). Pastured cows tend to be trimmer and will score lower than this at 3 or slightly less (Washburn et al. 2002). They should lose no more than 1 BCS during early lactation to avoid ketosis and rebreeding difficulties (Mahanna 1998). The following Web sites may provide additional information on BCS:
http://cahpwww.vet.upenn.edu/dairy/bcs.html
http://www.dasc.vt.edu/extension/nutritioncc/ELANCO.html

Monitor dry matter intake—Cows generally reach maximum daily intake 10 weeks after freshening (calving). At this point, they should be eating 4 percent of their body weight. For every 2 pounds of expected milk production, the cows should eat 1 pound of dry matter. Otherwise, they lose too much body condition and become prone to metabolic disorders. Forage consumption should be at least 2 percent of body weight to assure proper rumen function. Hot weather depresses intake. Temperatures above 75 degrees Fahrenheit cause a 3.3 percent drop in dry matter intake for each 2.2 degrees Fahrenheit increase. Heat stress occurs when temperatures exceed 80 degrees Fahrenheit, relative humidity exceeds 80 percent, or the two combined exceed 140 (Mahanna 1998).

In warmer regions, mid-day shade is needed to maintain intake (West 1995). Either provide portable shade in pastures or keep the milking herd off pasture and furnish stored feed under cover during the heat of the day. Pasture the herd at night when air temperatures are cooler. If possible, paddocks with natural shade areas should be rotated to avoid excessive nutrient accumulation in any one area when heat and/or humidity are extreme.

Monitor milk production—Ideally, milk production should be monitored for individual cows. If this is impossible, then farmers should monitor the bulk tank at end of each milking. Chart milk production and compare it with a normal chart for your region, dairy breed, and rolling herd average. Instructions on how to chart milk and use milk charts is in Dairy Production and Management Benchmarks, University of Georgia College of Agriculture and Environmental Sciences Extension Publication B1193 (Smith et al. 2002).

Monitor milk quality—Milk protein-to-fat ratios should be near 0.9 for Brown Swiss and Milking Shorthorns, 0.85 to 0.88 for Holsteins and Ayrshires, and near 0.8 for Guernseys and Jerseys. Higher values may indicate a fat test problem. Lower values may mean protein test problems from too much fat, or too little total or undegraded protein in the feed ration. Make sure the ration has enough effective fiber to produce a desirable fat test (Mahanna 1998). Lush cool-season grasses often do not have enough effective fiber if they test lower than 35 percent neutral detergent fiber (NDF). Fresh grass fiber is readily fermented in the rumen so only 40 to 50 percent may be effective (Kolver 2001).

Summary

A grazing-based dairy system can be a profitable alternative to a confinement dairy system (Jackson-Smith et al. 1996; Kriegel 2000; White et al. 2002). It requires a different skill set for the manager that involves managing and feeding a live, standing crop of forage rather than a forage crop that is cut, cured or fermented, and stored before feeding. Transitioning to a grazing-based system takes time, knowledge, patience, and experience. Find an experienced grazier or pasture group that can give advice or examples to follow at the outset. Attend grazing conferences where dairy grazing is a part of the program. Focus on accepted and tested practices that optimize livestock performance while sustaining the quality of the natural resources of the farm, watershed, and airshed.

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Part III

Case studies

Six case studies of farmers who have successfully implemented grazing-based dairies begin on the next page. These dairy farms span the Nation showing that any dairy farm situation can make grazing work. A commitment is required to make pasture the primary feed source and land use near the milking facilities. Pasture should be treated as a crop and as a feeding and housing facility. This means:

- keeping tabs on its soil fertility needs
- meeting soil test recommendations
- removing excess water
- providing irrigation water in more arid parts of the Nation
- scheduling harvests with at least as much care as if it were an alfalfa field
- creating an infrastructure in the pasture (fences, gates, water troughs, laneways, and perhaps shade structures) as is done with confinement operations at the farmstead to feed, water, and house livestock

Each of the six different farms takes a different approach to grazing-based dairying. This is because of the uniqueness of the individual or partners operating each farm and the uniqueness of the soil, water, and climatic resources each farm is faced with. All of them find it a rewarding experience.

Figure 14 Dairy cows returning to a fresh grass paddock along a laneway on this Pennsylvania farm. Heifer pasture is the back pasture just in front of the mountain range.

Owned by:
Dr. Edward and Peg Clarke

Operated by:
Peg Clarke

Location:
Lowman, Chemung County, New York

Local contact:
USDA NRCS
Waverly Service Center
109A Chemung St.
Waverly, NY 14892–1306
(607) 565–2106

No. acres:
600

No. pasture acres:
200

Breed(s) of cows:
Registered Jersey

No. lactating cows:
140

Average milk yield:
13,000 lb/cow/yr

Number of years grazing:
18

Grazing-based dairy issues:
Grazing system
Pasture management
Feed and water management
Challenges

Upon completion of her education in dairy production at Pennsylvania State University, Peg Clarke knew that she wanted to have her own dairy farm. However, it was not until she and her husband, Edward, visited New Zealand that she envisioned it as a grass-based system.

Peggy began dairy farming in 1984 with 30 cows and 40 acres of pasture divided into twenty-six 1.5-acre paddocks. In 1991, the Clarke's purchased an adjoining farm and expanded their enterprise to nearly 90 cows and 140 acres of pasture. Currently, they milk 140 cows, maintain 45 to 50 dry cows and bred heifers, and own or lease nearly 600 acres. To accommodate the larger herd size and make milking the herd easier and faster, a new barn with a double four-side opening milking parlor was built in 1995.

Milking is on a twice a day schedule year-round with peak cow numbers coming late in summer or early in fall. During the grazing season, only about 110 cows are in the milking herd at any one time.

Grazing system

Peggy grazes her herd of Jerseys using a rotational stocking method with the cows moved to a fresh paddock every day. Grazing generally begins in April and continues through October, with 180 days an average length of grazing season. Winter is the primary limit to the grazing season, followed by wet saturated spring soils. The farm receives about 33 inches of precipitation a year, and while drought can be a hindrance, it is a rare occurrence.

Pasture management

The pastures consist of mixed forage stands of orchardgrass, bluegrass, reed canarygrass, and red and white clover. They are fenced with two strands of high-tensile smooth wire and are subdivided into paddocks with polywire. Nearly 150 acres of the 200 acres in the system are harvested mechanically each year before being grazed. In some cases, this land is mechanically harvested twice before becoming part of the grazing system. As a rule, Peggy plans to harvest all of the land that is not too steep to harvest mechanically at least once every 3 years.

The soils are described as typical hill soils for the region, with moderate water holding capacity and good drainage. Soil fertility is maintained in the medium to high range, and pH is maintained in the low to mid 6s. The pastures receive 100 pounds of nitrogen per acre per year, as well as "brown water" from the manure storage lagoon. The barn is cleaned with a flush system, and after the solids are separated, the water is used to irrigate the pastures. The solids are spread as a dry material on the cropland.

Feed and water management

In addition to pasture, the herd also receives a total mixed ration consisting of corn silage, high moisture shell corn, cottonseed, and a mineral mix. On average, Peggy plans on the cows obtaining approximately 60 percent of their diet from pasture.

Water is pumped from the barn to troughs in each paddock. The cows are generally moved to a fresh paddock every day. The furthest paddock from the barn is nearly two-thirds of a mile distant, or about a 20-minute walk by the cows. There are no hoof or leg problems associated with this walk, and Peggy suggests that the fact that she has some 8- to 10-year-old cows in her herd, pasturing promotes healthy cows.

Challenges

Grazing is often described as a less labor-intensive method of dairy production compared with confinement dairying. While Peggy finds the work involved with grass-based dairying both enjoyable and satisfying, she is also quick to point out there are still plenty of things that need to be done and problems that need to be addressed. For example, with increased herd size, the layout and design of fencing systems takes more time and thought. The same can be said for getting water to the paddocks. Controlling flies is a little more problematic, and certainly the year-to-year differences in weather, and thus plant growth, make every year a unique challenge.

Despite these observations, Peggy has always grazed her dairy cows, and she is in no hurry to change. Future plans may include another herd expansion and a second barn. Grazing will be very much a part of the process as well as the possibility of manure composting.

All in all, Peggy is very satisfied with operating her farm as a grass-based dairy. In her view, grazing is an alternative production practice that, while not for everyone, is a method that works on her farm and others might consider trying.

Case Study 2—Sullivan Family Dairy

Owned by:
Kevin and Amy Sullivan

Operated by:
Kevin, Amy, and their children, Sara and Brian

Location:
Carthage, Northern Lewis County, New York

Point of contact:
USDA–NRCS
Lowville Service Center
P.O. Box 9
Lowville, NY 13367
(315) 376–7021

No. acres:
210 Total

No. pasture acres:
100–120

Breed(s) of cows:
Holstein, Jersey-Holstein cross

No. Lactating Cows:
65

No. of heifers and calves:
40

Average milk yield:
17,000 lb/cow/yr

Number years grazing:
15

Grazing-based dairy issues:
Pasture management
Grazing system
Challenges and advantages

The Sullivan family dairy farm is a seasonal grass-based dairy system located in a part of northern New York known for its long, cold winters and where snowfalls are often measured in feet. Despite the length and harshness of winter in this area, the moderate summer temperatures and generally adequate rainfall make the Tug Hill region nearly ideal for the production and utilization of perennial grasses.

The Sullivans began dairy farming with a conventional tie stall barn where the cows were fed in confinement the year round. However, because of the high production costs and labor associated with this type of feeding program, they soon began to look for a more cost-effective and less labor-intensive means to produce milk. In 1987, they turned their herd out to graze.

The Sullivans currently graze their 65 Holstein and Jersey-Holstein cross cows using a seasonal approach to milk production. The herd is spring freshened so that peak milk production coincides with the availability of the greatest amount of high-quality spring pasture. During the grazing season, milking is done twice a day in a homemade six-unit, step-up milking parlor. The entire herd is dried off during February and March.

This approach allows the Sullivans to produce the greatest amount of milk for the lowest cost during the summer months and reduce their winter feed costs by feeding only a low-cost maintenance ration to their herd during the drying-off period. It also allows them to take the 2 months off from milking.

Pasture management

The Sullivan's pastures consist mostly of orchardgrass-clover or orchardgrass-alfalfa mixtures with a small amount of perennial ryegrass. They are frost seeded with clover almost every spring. The primary hay fields are reseeded about every 6 years. Fertility is maintained using liquid manure from storage. All pastures are mowed at least once per season to control weeds and to eliminate vegetation that has become overmature. Little commercial fertilizer is used.

Grazing system

In a normal year, Kevin and Amy find they can graze their herd for nearly 6 months. The grazing season begins late in April or early in May and winds down by the end of October. The grazing system is constructed using a combination of electrified, high-tensile strength, smooth wire to form perimeters and polywire to create individual paddocks. The cows are generally moved to fresh grass three times a day. In addition to the pasture, each cow receives about

Case Study 2

12 pounds a day of a supplemental total mixed ration (TMR) consisting primarily of high-moisture shell corn and rolled oats. If drought limits pasture growth, chopped balage is fed along fencelines. Spring and fall transitions are accomplished by slowly decreasing or increasing the amount of TMR fed corresponding with pasture growth and forage availability. Some balage is also fed during the fall as pasture growth begins to slow.

The furthest paddock from the barn is a 20-minute walk for the herd or between a half and two-thirds of a mile distant. To keep the herd grazing once they get to a pasture, water is pumped from the barn through either 3/4- or 1-inch plastic pipes to portable tanks in each paddock. Kevin notes that while he occasionally sees a cow with a sore foot, herd health is generally excellent. As evidence of this, Kevin points out he has some 8-year old cows in his herd. This means that instead of culling cows because of problems, he has the opportunity to sell cows and heifers at a profit. Veterinary costs, including vaccinations and dry cow treatments, average $16 to $18 per cow per year.

Challenges and advantages

Kevin is quick to point out that “grazing is not easy and is not a magic bullet. It works for people who are willing to take the time to make it work. However, it takes thinking and dedication to stick with it until you learn and understand the process. It takes more management than conventional dairying.” He cites his biggest problem is keeping track of his feed supply. “Guessing what the weather is going to do to forage yield and quality is not easy. However, you get back what you put into it.”

Kevin suggests that grazing has allowed them to handle 65 cows with about the same amount of time and effort that it took them to handle 40 when they were a conventional dairy. Furthermore, Kevin concludes, “they can make a good living without pushing the cows’ production.” This in turn allows the cows to last longer and breed back sooner. Being seasonal means that April, May, and June are extremely busy on the Sullivan farm. However, the winter months are so enjoyable for the Sullivans, especially February and March, that Kevin states, “they would never go back to milking cows the year round.”

In addition to improving the quality of their lives and the lives of their cows, Kevin also points out both the environmental, as well as economic benefits. “Being sod-based, soil erosion is little to nothing. As well, we use very little chemicals, either in herbicides or in fertilizers. We have lower inputs for fuel, electricity, feed supplements, fertilizers, and repair bills, which simply adds to our bottom line.”

While seasonal grass-based dairying is not suitable for every dairy farm or dairy producer, for the Sullivans it is the perfect blend of lifestyle and standard of living. Also, milk processing plants in their area are less concerned about fluctuations in milk production at the farm caused by all the cows in a seasonal calving herd being nearly in the same number of days in lactation.

> *“It is not easy, it is not just a job, it is a way of life.”*
>
> *Kevin Sullivan*

Case Study 3—Mallonee Dairy

Owned and operated by;
Maynard and Kim Mallonee, parents John and Mary, and son Jack

Location:
Lewis County, Washington

Local contact:
USDA–NRCS
Chehalis Service Center
1554 Bishop Rd.
Chehalis, WA 98532–8710
(360) 748–0083

No. acres:
215

No. pasture acres:
90

Breed(s) of cows
Holsteins

No. cows:
65

No. heifers:
60

Average milk yield:
65 lb per day

Grazing-based dairy issues:
Overview
Grazing system layout
Pasture management
Additional farm activities

Mallonee Dairy is owned and operated by Maynard and Kim Mallonee along with their parents, John and Mary, and son, Jack. The Mallonee Dairy is a transitional-organic grazing dairy located in Lewis County in western Washington. The dairy is home to approximately 65 Holstein cows and 60 heifers. Of the 215 acres on the farm, 90 acres are pasture for grazing dairy cows.

Grazing has been a tradition on the Mallonee Dairy for several generations, and they plan to continue grazing in the future. According to Maynard, maintaining a high level of milk production has been one of the greatest advantages of grazing. In addition, the Mallonees feel that grazing has played an important role in preventing cow health problems and increasing cow longevity.

The Mallonee Dairy is an organic dairy. The land has been certified organic for several years. Organic dairying assures the Mallonees that they are decreasing health concerns for their animals as well promoting a safe product for consumers. Although the Mallonee Dairy was always close to being organic, economic considerations led them to seek certification to sell their product as organic.

To diversify farm income, Mallonee Dairy also supports a small organic beef cattle enterprise. The beef enterprise combines easily with the grazing system already present for the dairy cattle and is an additional enterprise for the farm. It includes breeding stock and organically raised, grass-fed steers.

In addition to the usual daily activities on the dairy, the Mallonee family is also making an effort to advance nutrient management knowledge by volunteering an area of their pasture for university research studies. A research study was started in January 2002 to determine the effects of manure application during winter months.

The wet conditions of western Washington are among the greatest challenges for the Mallonee Dairy. Average rainfall in this part of Washington is 60 inches. About 80 percent of the rainfall occurs from September through April. The saturated field conditions during winter limit the grazing season and require feeding of stored forages for about 6 months.

Cows are milked twice a day in a double two-side release parlor. The cows average around four lactations, with several cows reaching 6 or more.

Overall, few health problems are seen on this dairy. The health problems of greatest concern are milk fever occurrences in early spring when cows are moved to pasture and an occasional case of foot rot if conditions become wet and muddy.

Grazing system layout

The grazing season lasts from around May 1 to November 1. The lactating cows are on a management intensive grazing program and are moved to a new strip of pasture at least once a day. In spring when grass growth is lush, cows are moved to a new strip of pasture on a daily basis. As the grass growth slows in summer and fall, cows are moved twice a day to provide adequate amounts of grass. Each pasture is grazed four to five times per year. The grazing season is limited by soil saturation resulting from the high rainfall during the winter. In contrast to the lactating cows, heifers are on a rotational grazing system and are moved once every 3 or 4 weeks throughout the summer months.

The pastures are located less than a quarter mile from the milking parlor and have a terrain that is fairly flat. Moving the cows from pasture to the milking parlor takes about 15 minutes. Once in the milking parlor, cows receive a grain supplement while they are milked. During the grazing season, lactating cows are given 25 pounds of grain per day. Besides the grain, cows are supplemented with a mixture of salt and trace minerals, which they have access to while they are grazing. Water is made available through a hose and trough system that is moved with the cows from pasture to pasture. Water accessibility is one of the main factors that prevent the grazing pastures from extending further from the milking facility.

Forage supplementation begins in October to help transition cows into a winter-feeding system that includes preserved forages. During the winter months, cows are housed in a freestall barn where they are fed a combination of forage harvested from pastures and purchased hay.

Pasture management

Pastures are maintained in native (i.e., commonly occurring, but mostly introduced species that have naturalized) forage species and are not replanted on a regular basis. Tall fescue is the main grass species though a variety of other grass species occur, and several pastures are approximately 25 percent clover. In the spring, grass species overtake the clover, thus the best clover growth occurs after the first cutting of grass has been removed from the pasture. Pastures with sandy loam soil are the first pastures grazed each spring because they dry faster than those with more clay in the soil. The Mallonee Dairy has not had any particular problems with weed species. Grazing and clipping the pastures appears adequate to control weeds.

In addition to grazing, pastures are mechanically harvested at least once a year and may be harvested a second or third time if weather conditions allow. Harvested forage is stored as dry hay or wrapped silage bales and used as a feed source during the winter.

During the summer months, pastures are irrigated after cows finish grazing and are moved to another pasture. The irrigation system is a hand-line sprinkler system that is manually moved from pasture to pasture. Besides the normal summer irrigation, pastures are also irrigated after they are fertilized to encourage fertilizer incorporation. Pastures are fertilized with manure once per year using broadcast application.

Additional farm activities

Besides the ongoing winter application study, the Mallonee Dairy plans to continue assisting with research projects and was part of a research study that began in November 2003. The second research trial monitored fecal bacteria in runoff from fields receiving applications of dairy manure slurry. This research trial was an important component to determine the risks of winter manure application. The research results formed the basis for writing Agronomy Technical Note 14, *Winter Period Application of Manure in Washington State* by the Washington State NRCS office. Risk of transport of dairy slurry nutrients nitrogen, phosphorus, and potassium were also studied.

Another research trial conducted at the farm measured nitrogen uptake of forage crops where manure slurry was applied at two different rates. Reports of all these findings have been produced by Washington State University Extension at Puyallup.

Owned and/or operated by:
Wangsgard family

Location:
Cache County, Utah

Local contact:
USDA–NRCS
North Logan Service Center
1860 North 100 East
North Logan, UT 84341-1784
(435) 753-5616

No. acres:
290 (two farms)

No. pasture acres:
80 (+ 20) + 150 on home farm

Breed(s) of cows:
Holstein

No. cows:
150

No. heifers:
250–300

Average milk yield:
15,000 lb/cow/yr

Grazing-based dairy issues:
Objectives
Pasture Grasses
Grazing System Layout
Irrigation, Fertilization and Manure
Pests
Economics

Mike Wangsgard, his wife Beth, and his father Ross manage a 150-cow dairy herd with approximately 250 to 300 heifers in Cache County, Utah. Their farm business is split between two farms of approximately 150 acres each, Young Ward Farm and Cornish Farm. Grazing currently takes place on about 150 acres on Young Ward Farm. Cornish Farm and the remainder of Young Ward produce primarily alfalfa for winter feeding. Cornish Farm has 80 acres in pasture with 20 more planted in 2002.

Mike and his family run a semi-seasonal pasture dairy. The cows are turned out on pasture around May 1. The Wangsgards begin supplemental feeding around October 1, but the animals are outside for most of the year, remaining in the barn only when it becomes too muddy in the spring. Breeding is timed so the cows are dry during the winter so supplemental feeding is cheapest.

Objectives

Mike's main objective is to maintain a profitable dairy over the long term. The family has been milking for two generations, and Mike would like his children to have the opportunity to continue if they so choose. To this end, the Wangsgards are contemplating converting one of their two farms to an organic dairy, using the other to manage any cows that might become sick and need to be isolated or receive antibiotic treatments.

Pasture grasses

Each pasture at Young Ward Farm has one grass species mixed with one or more legumes. The grass species include a mixture of different fescues, orchardgrass, bromegrass, perennial ryegrass, and native (naturalized, not intentionally planted) quackgrass. Each grass species has its own growth rate, nutritional value, palatability, and maturity. The Wangsgards keep the grass species separate so they can be more effectively managed.

The fescue on the farm forms a dense sod and starts growing early in the spring. Cows are turned onto fescue pasture first. They graze it lightly, but frequently, as it is less palatable than many of the other grasses, especially when it is allowed to mature. Perennial ryegrass is a highly palatable species, so it is allowed to grow taller and be grazed lower and rested longer than the fescues. Orchardgrass is the highest yielding forage species on the farm. It must often be mechanically harvested to prevent it from growing too rank before it can be grazed. Some grasses and some fields are easier to mechanically harvest than others are. They are often saved for mechanical harvesting. Mike

Case Study 4

advises farmers contemplating a grazing-based system to get to know their grasses and learn to manage what they have. “Native (naturalized) grasses are there for a reason—because they work best,” he says.

Grazing system layout
Young Ward Farm is a quarter-mile wide and three-quarters-mile long, with an alley down the center. Gates and water troughs are located about every 300 feet along the alley. Portable fences that allow access to one or two water troughs are moved every 12 hours so that the cows receive new pasture after every milking. A grain supplement and minerals are fed in the barn as the cows are being milked. These are supplied by the local grain elevator.

Irrigation, fertilization, and manure
A quarter of the farm is flood irrigated every week so at least half of the fields are accessible to grazing at any one time (allows the irrigated ground to dry for 1–2 weeks). Grazing is timed to avoid conflict with the irrigation schedule.

Soil tests have shown phosphorus and potassium to be adequate, but not excessive in the pastures. Fields are generally fertilized with nitrogen once in early spring and again during the summer. What little manure is produced in the barn during the summer is stockpiled and applied to the fields in the fall. Manure collected over the winter is applied in the spring before grazing begins and usually before green-up. Manure contamination of feed has not been a major issue when manure is applied in this fashion.

Pests
The biggest pest problems the Wangsgards have encountered have been biting flies, mosquitoes, and weeds. The flies and mosquitoes result (they expect) from the farm’s location in bottomlands where they thrive. Grazing probably does not exacerbate the problem. Weed pressures are most severe in new pastures, so weed control is critical during establishment. In mature pastures, barley headed foxtail and thistles are the worst weeds. Spot spraying is used to control thistles. Irrigation ditches that harbor barley headed foxtail are sprayed before the grass heads out and when ditch is empty of water.

Economics
The advantages of this system over confinement dairies include cheap feed, healthier cows, and reduced labor. As the farm is largely a family run business, labor savings are important. Cost savings are also important. Mike points out that, “Whatever you put into a cow produces a return in milk, but the return diminishes depending on the input.” Water is the most cost-effective input you can supply. Next is alfalfa grass, and finally grain. In this part of Utah, adequate water and forage produce approximately 45 pounds of milk per animal day. Grain produces another 5 pounds per day. Whether a major grain supplement is justified depends on the price of milk and the price of grain.

Owned and operated by:
Buck and Dorothy Shand

Location:
Dallas County, Alabama

Local contact:
USDA–NRCS
105 Moseley Dr., Suite A
Selma, AL 36701
(334) 872–2611 ext. 3

No. acres:
1,650 total

No. pasture acres:
1,450 (200 dairy; 1,250 beef)

Breed(s) of cows:
Holstein-Jersey Cross

No. cows:
100

No. heifers:
30–35

Average milk yield:
14,000–15,000 lb/cow/yr

Variable cost/100 wt. milk:
$5.04–$8.52, $6.52 average (2003 data)

Grazing-based dairy issues:
Grazing system
Animals
Future plans

Buck Shand and his wife Dorothy have a 1,650-acre farm in Dallas County in central Alabama. Two hundred acres of the farm is devoted to dairying. Buck has been around the dairy business his entire life. He began the transition from confinement to a grazing-based system in the mid 1990s when it became apparent that the price of milk was not keeping up with inflation and quality labor was becoming difficult to find. Based on fairly detailed recordkeeping, he realized he needed to cut costs to stay in business. Dallas County is in the black belt of Alabama where the dominant soils are heavy black clays and rainfall is usually plentiful. This is ideal grass-growing country—perfect for grazing. Buck looked backward to the time when most farmers were grazing their dairy cows and forward to a grazing system developed in New Zealand, and decided to convert to a grazing-based dairy system.

To get started, pastures had to be developed and fencing, laneways, and watering facilities were needed, but a lot of equipment could be retired. One step in the transition was to start breeding the Holstein herd with Jersey bulls. Jerseys are a smaller breed than Holstein. On grass the two breeds produce about the same amount of milk. Breeding smaller animals that consume less feed seemed a logical step.

Grazing system

The dairy has four pastures that are subdivided by permanent and portable electric fencing. Water is provided for each pasture. Laneways have drainage tile to keep them from becoming muddy. Pastures are rotated daily. Each pasture is rested for 30 to 45 days after being grazed. In the spring when grazing cannot keep up with the lush growth, pastures are mechanically harvested and saved for use later when dry matter is low.

The primary forage crops on the dairy are dallisgrass, white clover, Persian clover, and several hardy fescue varieties with beneficial endophytes. The clovers and dallisgrass grow naturally on the farm, but Buck is planting the fescue over time and eventually hopes to have 200 to 300 acres of fescue pasture (some of which may be used by the beef cattle). The forage species are seasonal. White clover is a winter perennial that is grazed early and sets seed by mid June. Persian clover is an early annual that grows during most winter months. The fescues are cool-season grasses that do best early in spring and late in fall. Dallisgrass is most active in the summer months. This variety of forage crops permits grazing 10 months of the year.

Pastures are fertilized strictly according to soil test recommendations and rarely need any additions except phosphorus. During drought, feed is supplemented with cottonseed to prevent overgrazing. In the barn, cows are also fed soy hull pellets.

One of Buck's challenges is weeds in the pastures. Buttercup in the spring and camphorweed, ironweed, and cocklebur in the summer are some of the main problems. These generally can be controlled with 2,4–D when necessary. Wild onion in winter pastures can affect milk flavor. To avoid this problem, cows are taken off winter pasture 2 hours before milking.

Animals

The cows on Buck Shand's dairy farm are generally very healthy. As long as the cows are kept out of the mud, mastitis and other health problems have been minimal. The pastures are rotated daily using electric fencing to keep the cows out of the mud. Drainage tile has also been placed under areas that tend to pond water.

Cows are milked twice a day in a double-4, straight-through milking parlor. "It's old, but effective," says Buck. With this system 8 cows can be milked every 10 minutes. Travel time from the pastures to the barn is about 15 to 20 minutes. Cows tend to remain productive for 5 lactations. The average number of lactations per cow in this part of Alabama, according to a University report, is 1.5.

Manure management

Animal waste management has become relatively simple since the transition to grazing. Most of the waste is spread on the pasture by the cows themselves. Waste that is produced in the barn is pushed into a dry stack where solids and liquids are separated. Liquids flow to a treatment pond, and solids are periodically spread on the pastures.

Future plans

Buck plans to develop a calf feeding operation on the farm once the pastures have been renovated. He thinks this will be a profitable new enterprise. He also plans to do a better job of managing farm records to increase the profitability of the dairy. Overall he is happy with his move to grazing. "It's an enjoyable enterprise, and it's reasonably profitable," he says. "We think this part of the country could stand some more dairy operations. If they're sustainable and grass-based, they could be profitable. Our heavy clay soil is well adapted for growing grass."

Owned and operated by:
Tom Trantham

Location:
Pelzer, South Carolina

Local contact:
USDA–NRCS
301 University Ridge, Suite 3900
Greenville, SC 29601
(864) 467–2755 ext. 108

No. acres:
97.6

No. pasture acres:
70

Breed(s) of cows:
Holstein

No. cows:
75 (10% dry)

No. heifers:
59 (off farm/contracted with neighbor farmer)

Average milk yield:
19,600 lb/cow/yr

No. years grazing:
15

Grazing-based dairy issues:
The herd
Facilities
Forage management
Waste and irrigation
Economics
Transition

Tom Trantham owns a 97.6-acre dairy in Pelzer, South Carolina. The dairy is 25 years old, and Tom has been farming it since 1978. The farm was struggling in April 1988, when the milk cows pushed through the confinement feeding area and began grazing a vacant field that had been scheduled for chemical burndown. The next milk pick up averaged 2 pounds more milk per cow than the previous milk pick up. Thus began Tom Trantham's transition from a confinement dairy to a grazing-based system. Prior to the "accident," the farm had been winning South Carolina milk production awards, but still could not pay the feed bills.

From 1994 to 1997, Tom participated in a Sustainable Agriculture Research and Education (SARE) research grant with Clemson University to determine the feasibility of a minimum input, financially sound grazing dairy. He has also participated in a Southern SARE Professional Development project that took him to Ireland where he learned about the importance of paddock size and irrigation for improving production.

The herd

The herd consists of 75 milk cows, 10 percent of which are dry at any time of the year, but most of which are still producing at 10 to 14 years old. Tom selects bulls of smaller stature that pass on what he calls "dairiness" traits, such as strong feet, deep barrel, and high quality udders. He also looks for bulls with a lot of white in their color pattern to help compensate for the South Carolina heat. He used to raise his own heifers, but now contracts them out at 3 months old, getting them back 2 months before their first calving. This way he can concentrate on the milk cows, and the contract farmer can concentrate on the heifers.

Milking occurs twice a day. Tom uses a side opening, single-4 milking parlor rather than the more efficient herringbone design because it places the cow broadside where he can see her entire body twice a day.

Facilities

The farm consists of 25 paddocks (2.5–3.2 acres each) surrounding the farmhouse and milking barn, a manure sediment lagoon that now only receives wash water, a trench silo now used as a well-water reserve for diluting liquid from the manure sediment lagoon, and a harvestore silo that has been converted to a milk processing plant to bottle the dairy's own milk. The perimeter fence has three to five strands of high tensile wire. Fence along the lanes has two strands, and one strand is used for temporary cross fencing. All fences are electric. The rest of the essential equipment consists of an 80–HP tractor, manure spreader, no-till planter, and rotary mower.

Forage management

The paddocks are typically managed as follows. New forage is no-till planted into each paddock where the recently grazed crop is no longer productive. After the cows move off, any remaining ungrazed pasture is cut and baled for dry cows and heifers. The timing of each task depends on weather, maturity date of the crop, and how much the cows graze the paddock during the growing cycle. Knowing the crop maturity date is critical to the management system. Different forage crops mature at different rates, and once they mature their value for grazing is diminished. The exception is alfalfa, which maintains its nutrition throughout its life cycle. Tom's rule of thumb for the pasture is to graze when the crop is below the knee and bale when it is above the knee.

The forage crops planted on Trantham Dairy Farm include corn (grazing maize), trudan, millet, small grains, alfalfa, and clover. Tom continues to experiment with forage crops, looking for crops with the right vigor, nutrition, and growing season to improve the grazing system. He uses a notebook to keep track of the planting and grazing schedule. He monitors the soils regularly for nutrient imbalances and applies lime periodically to offset the export of calcium in the milk. He also monitors the forages closely to determine the need for supplemental feeding. Tom estimates that currently about 50 percent of the cows' nutrients come from supplemental feeding, though a lot depends on the weather.

Animal comfort, waste, and irrigation

Most of the paddocks have some natural shade. In hot weather, early morning grazing is scheduled in those paddocks without shade.

Cows are watered from 300-gallon Rubbermaid® troughs on geotextile pads in each paddock. A 40-foot-long watering trough is also supplied along the path as cows leave the milking parlor. Tom is experimenting with a variety of materials for his laneways, which need to be mud-free for animal health.

Manure is scraped daily from the cement milking and feeding areas. Solids are separated out and spread on pastures weekly using a calibrated side-opening spreader. Cows are kept off freshly manured paddocks for 5 to 25 days. The wastewater is stored in the waste lagoon along with wash water from the milking parlor. The trench silo currently holds well water. A suction hose and gate valves connect the two reservoirs and allow for mixing. Newly planted or freshly grazed paddocks receive more manure and less water. During droughts, paddocks receive more water and less manure. Of the 25 paddocks, 16 are fitted with an irrigation system that carries water underground from the trench silo/waste lagoon. The system is currently being expanded to collect all runoff water from the farm and store it in a newly constructed reservoir that can be pumped back to the paddocks.

Transition

Tom shares his experiences with other dairy farmers considering transition to grazing. "I believe the farmers of today have the responsibility of leaving things in better shape for the next generation of farmers," he says. "What I've learned would go to waste if it stopped with me." He recommends the first step in a transition is to "get the herd grazing." A good place to start in his region might be to plant a winter grazing crop, such as rye, after the corn harvest. Milk production may initially drop, but TMR costs immediately go down, and over time production should increase as the system develops. As profit margins increase with each transition stage, more improvements can be made, but the job is never done. "That's the beauty of this kind of dairying," says Tom. "Every day you wake up with more ideas you want to try."

**Information for this case study was gathered from a former web site before the current updated and expanded one listed here: http://www.southernsare.uga.edu/twelve/trantham.html with permission from Tom Trantham.*

Attachment B: Wisconsin's Grazing Success: Grazing dairy farms show profit and promise Center for Integrated Agricultural Systems • UW-Madison College of Agricultural and Life Sciences • February, 2005

Wisconsin's Grazing Success

Grazing dairy farms show profit and promise

What is managed grazing?

Over the past ten years, many farmers have implemented managed grazing on their livestock and dairy farms. Farmers using managed grazing move animals to fresh pasture on a regular basis and manage the pastures to maximize the quality and quantity of feed. Farmers divide pastures by fencing them into smaller units called 'paddocks.' After grazing, the paddocks are rested so the plants can recover and regrow before being regrazed. Animals on a managed grazing farm derive a major portion of their feed from pasture during the grazing season.

In contrast, many other farms use continuous grazing, where animals graze the same pastures over a long time. While animals benefit from fresh air and exercise, these pastures do not provide much quality feed.

Who uses managed grazing?

In Wisconsin, a growing percentage of dairy farmers are using managed grazing. Survey research from the **Program on Agricultural Technology Studies (PATS)** at UW-Madison shows that in 1993, 7 percent of Wisconsin dairy farmers used managed grazing; in 1995, 14 percent; in 1999, 22 percent; and in 2003, 23 percent. These farmers vary in their approach to grazing: one-third of the respondents using managed grazing in 1999 moved their milking cows to fresh pasture once a day or more; another third moved cows every two to six days; and the remaining third moved cows weekly.

Beginning farmers are much more likely to use managed grazing than other dairy farmers. A 1996 PATS survey showed that nearly 30 percent of new dairy farmers used managed grazing, almost twice the 14-15 percent rate for dairy farmers as a whole at that time. Additionally, nearly 46 percent of new farmers indicated that they planned to use improved pastures to obtain feed for their milking herd in the future.

Why use managed grazing?

A managed grazing system is usually less expensive to set up than a confinement dairy. Since the cows harvest a portion of their feed and spread their own manure while grazing, less equipment is needed for feed and manure handling compared to confinement farms. Cows tend to live longer on managed grazing farms, meaning less money is spent on replacement animals. There is also more income potential from selling heifers.

Typically, farms using managed grazing produce less milk per cow than confinement farms. However, a series of economic studies in Wisconsin and elsewhere show that, for many dairy farmers, the savings they realize from using managed grazing more than offsets the loss in milk revenues due to lower production. **These studies show that grazing farms are economically competitive with confinement operations.**

How were the studies carried out?

Tom Kriegl of the **UW-Madison Center for Dairy Profitability** has been analyzing financial performance of graziers with the Wisconsin Grazing Dairy Profitability Analysis every year since 1995. In the first year, data from 19 farms were summarized; that number rose to 31 in 2002. In 2000, a USDA Initiative for Future Agriculture and Food Systems grant expanded that research to a regional study covering finances on managed grazing dairy farms in the Great Lakes states, plus Iowa and Missouri. Data from 92 grazing farms were summarized in that study in 2000; 126 in 2001; and 103 in 2002. Farmers participating in these financial surveys must earn 85% or more of their gross income from milk sales or 90% from dairy livestock sales plus milk sales. To be considered a grazier, a farmer must harvest over 30% of seasonal forage needs by grazing and must provide fresh pasture at least once every three days.

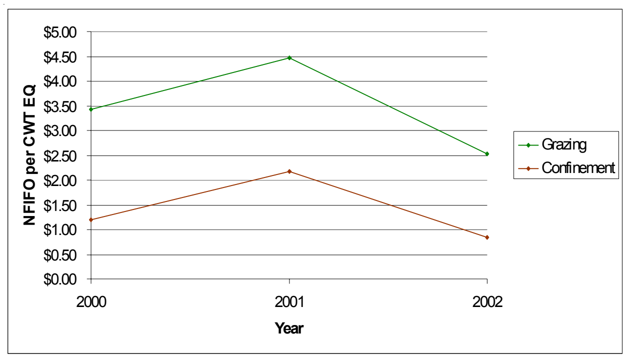
Standardization of data handling and analysis procedures relied heavily on the Farm Financial Standards Guidelines (revised December, 1997). The computer program Agricultural Financial Advisor (AgFA) was used to analyze the data.

What were the key findings?

Kriegl reports several key points in his analysis:

- In Wisconsin and New York, graziers were more profitable per cow and per hundredweight equivalent (CWT EQ*) than their confinement counterparts in these states. In addition, Wisconsin graziers were more profitable per cow and per CWT EQ than graziers in most other states providing data.
- Farms using managed grazing consistently showed higher net farm incomes from operations (NFIFO**) per CWT EQ and lower costs per CWT EQ than traditional and large modern confinement farms in Wisconsin.
- Farmers who switch from confinement dairy farming to managed grazing need not suffer financial hardship during the transition.

Financial performance of two dairy types in Wisconsin, 2000-2002



Source: *Dairy Grazing Farms Financial Summary: Regional/ Multi-State Interpretation of Small Farm Data*, April 2004.

And comparisons between grazing farms show that:

- The average most profitable grazing farm in Wisconsin produced slightly more milk per cow and had slightly lower costs per cow and higher income per cow than the average least profitable grazing farm. The average most profitable grazing group had a better handle on most categories of costs, did a better job of generating income, and had lower interest, depreciation, and labor and management expenses.
- The average grazing dairy farm with under 100 cows was more profitable per cow and per CWT EQ than those with over 100 cows. Lower labor costs account for much of this advantage.
- Graziers are making a variety of strategies work for them. Some graziers use a seasonal calving strategy, some are certified organic, and some use milking parlors. No single approach seems to be the right or only way to manage a grazing dairy farm.

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*CWT EQ (hundredweight equivalent): **an indexing procedure which focuses on the primary product that is sold and standardizes farms in terms of milk price and many other variables for analysis purposes.** The use of an equivalent unit is the most meaningful measure when calculating the cost of producing milk, because dairy farm businesses have multiple sources of income. The measure is calculated by summing the income from the sale of all products produced on the dairy farm and dividing by the national average milk price to calculate the equivalent number of hundredweights sold. The equivalent hundredweights are then divided into the expenses to calculate the cost per CWT EQ. (See *Cost of Production Versus Cost of Production*, Dr. Gary Frank, UW Center for Dairy Profitability, 1997.)

NFIFO (net farm income from operations): the income that is left over after all costs except opportunity costs have been accounted for. NFIFO represents returns to unpaid labor and unpaid management, and equity (owned) capital invested in the business. **NFIFO is the amount of income a family could 'consume' from business earnings in a given year without reducing business net worth.

This summary is an excerpt from a report titled "Pastures of plenty: Financial performance of Wisconsin grazing dairy farms," funded by a USDA-CSREES grant to CIAS and by the Wisconsin Milk Marketing Board. Visit the UW-Madison Center for Integrated Agricultural Systems website at www.cias.wisc.edu for more information on grazing research. Visit the Center for Dairy Profitability website at www.cdp.wisc.edu and the Program on Agricultural Technology Studies website at www.pats.wisc.edu for more information on the studies and publications mentioned here.

Attachment C: Cornell's Dairy Farm Business Summary Measuring The Impact of Pasture for New York's Dairy Farms

Cornell University
Cooperative Extension
Cortland County

Cornell's Dairy Farm Business Summary

Measuring The Impact of Pasture for New York's Dairy Farms

Since 1996 The Department of Applied Economics and Management at Cornell College of Ag and Life Sciences has collected and published business summaries for 30-50 NY dairy farmers that make use of pasture on their farms. The following are some of the excerpts from this Dairy Farm Business Summary (DFBS).

1996-2004

Item	Grazing Farms	Confinement Farms
Number of cows	92	94
Milk price/ cwt. (100lbs)	$14.40	$14.33
Milk produced/cow	17,021lbs.	18,924lbs.
Operating cost/ cwt	$10.60	$11.04
Total cost/cwt	$15.83	$16.42
Net Farm income/cow	$441	$347
% Return on equity	3.28%	.56%

One of the biggest difficulties confinement dairies face when they begin the transition to a pasture based dairy is the probable drop in milk production. For years there has been an unstated link between milk production and profitability. Many dairies will give up on the transition when the level of milk in the bulk tank starts to drop. For those that complete the transition and who have kept good records, they find that there is usually an economic return from pasture.

Profits are not the only benefits that NY dairy farmers have discovered by converting to a pasture based system. The Grazing-DFBS asks each year "Has the adoption of grazing impacted your family's' quality of life?" The respondents have answered positively 80% of the time. Some of the other comments are:

- Reduced chore time
- Healthier cows
- More opportunity to involve the children
- Positive comments from neighbors

There is a tremendous amount of opportunity to help more dairy farmers in the Northeast to adopt grazing. To do so will take money for continued research and extension projects. Some of the projects that have made difference to date are:

- GRAZE NY, sponsored by Congressmen Walsh and Boehlert
- Cornell's Dairy Farm Business Summary
- Grazing Lands Conservation Initiative (GLCI)

Cornell's Dairy Farm Business Summary

INTENSIVE GRAZING FARMS VS. NON-GRAZING FARMS: New York State Dairy Farms, 2004

Item	All Intensive Grazing Farms[4]	Non-Grazing Farms[5]	Average Top 30% Farms[6]	Profitable Non-Grazing Farms[7]
Number of farms	30	84	10	11
Business Size & Production				
Number of cows	104	103	110	114
Number of heifers	74	84	96	102
Milk sold, lbs.	1,774,400	1,982,870	1,885,320	2,453,174
Milk sold/cow, lbs.	**17,144**	**19,202**	**17,186**	**21,434**
Milk plant test, % butterfat	3.50%	3.34%	3.66%	3.76%
Cull rate	**22.1%**	**29.6%**	**20.0%**	**25.9%**
Tillable acres, total	267	321	265	370
Hay crop, tons DM/acre	2.9	2.9	3.2	3.7
Corn silage, tons/acre	15.3	16.5	18.0	19.4
Forage DM/cow, tons	5.8	9.3	5.9	10.9
Labor & Capital Efficiency				
Worker equivalent	2.90	3.30	2.63	3.35
Milk sold/worker, lbs.	611,862	600,870	716,852	732,291
Cows/worker	**36**	**31**	**42**	**34**
Farm capital/worker	$261,810	$291,433	$271,470	$275,594
Farm capital/cow	**$7,300**	**$9,337**	**$6,491**	**$8,099**
Farm capital/cwt. milk	$43	$49	$38	$38
Machinery & equipment per cow	**$1,287**	**$1,998**	**$1,306**	**$1,917**
Milk Production Costs & Returns				
Selected costs/cwt.:				
Hired labor	$1.71	$1.71	$1.39	$1.78
Grain & concentrate	$4.24	$4.67	$3.96	$3.69
Purchased roughage	$0.52	$0.17	$0.25	$0.06
Replacements purchased	$0.06	$0.26	$0.05	$0.01
Vet & medicine	$0.43	$0.54	$0.41	$0.53
Milk marketing	$0.85	$0.88	$0.83	$0.57
Other dairy expenses	$1.12	$1.34	$1.04	$1.36
Operating cost of producing milk/cwt.	$11.83	$12.63	$10.50	$10.22
Total labor cost/cwt.	$4.29	$4.32	$3.45	$3.80
Operator resources/cwt.	$3.82	$3.90	$3.18	$3.16
Total cost of producing milk/cwt.	$17.66	$18.30	$14.89	$14.80
Average farm price/cwt.	$17.27	$17.02	$17.12	$16.83
Related Cost Factors				
Hired labor/cow	$291	$329	$239	$384
Total labor/cow	$732	$831	$592	$817
Purchased dairy feed/cow	$812	$931	$721	$807
Purchased grain & conc. as % of milk	25%	27%	23%	22%
Vet & medicine/cow	**$74**	**$103**	**$71**	**$115**
Machinery costs/cow	**$598**	**$714**	**$499**	**$728**
Feed & crop exp./cwt.	$5.55	$5.79	$5.30	$4.89
Profitability Analysis				
Net farm income (with appreciation)	$98,089	$91,775	$121,675	$158,621
Net farm income (without appreciation)	$67,810	$58,833	$105,259	$131,318
Net farm income / cow (w/o apprec.)	$652	$571	$957	$1,152
Net farm income / cwt. (w/o aprec.)	$3.82	$2.97	$5.58	$5.35
Labor & management income/operator	$22,397	$9,555	$57,202	$57,373
Labor & mgmt. income/operator/cow	$215	$103	$520	$503
Rates of return on Equity capital with apprec.	9.3%	6.1%	17.0%	18.5%