Cattle Production: Considerations for Pasture-Based Beef and Dairy Producers

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Market demand is rapidly increasing for sustainably-raised beef and dairy products. Pasture or grass-based livestock production is inherently sustainable as this production system relies on biodiversity and ecological complexity to maintain production without the use of costly inputs. Cattle producers are beginning to recognize that intensively-managed rotational grazing (also called management-intensive grazing or planned grazing) can lower production costs, reduce animal stress, and boost the animal's immune system. This publication highlights these and other practices producers are using to provide customers with nutritious food from sustainable farms and ranches.

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Introduction: Towards a Pasture-Based Cattle Production System

Cattle are natural grazers. They possess the remarkable ability to digest plant carbohydrates that are generally indigestible to most other mammals. It is natural then to assume that grazing is the best way to supply a nutrient-dense diet to growing cattle. Since the end of World War II, however, this has not been the case.

The widespread use of synthetic, soluble fertilizers and other agri-chemicals emerged in the mid-twentieth century. These materials, coupled with plant breeding technology and larger machinery for more efficient tillage and harvesting, led to unprecedented high corn yields and subsequent cheap corn prices. Crop subsidies became part of the U.S. Department of Agriculture (USDA) policy. With subsidized prices, agricultural producers continued to provide markets with large quantities of corn. An economic incentive was created to finish beef on corn rations and to feed it to high-producing dairy cattle.

Prior to this period, cattle production was an integral part of diversified family farms. Cattle would consume crop residues and forages, and contribute manure to the soil. The farm family would always have a beef

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Beef Farm Sustainability Checksheet

Beef Marketing Alternatives

Dairy Beef

Dairy Farm Sustainability Checksheet

Dairy Resource List: Organic and Pasture-Based

The Economics of Grass-based Dairying

Grass-Based and Seasonal Dairying

Grazing Networks for Livestock Producers

Grazing Contracts for Livestock

Managed Grazing in Riparian Areas

Multispecies Grazing

Nutrient Cycling in Pastures

Pastures: Sustainable Management

Pastures: Going Organic

Paddock Design, Fencing, and Water Systems for Controlled Grazing

Raising Dairy Heifers on Pasture

Rotational Grazing

Value-added Dairy Options

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for the year, and the surplus was sold off the farm to contribute to the food needs of the community. A surplus of cheap corn combined with low fuel prices helped to foster the industrialization of cattle production. High-energy feedstuff in large volumes was provided to feedlots of ever-increasing size and scale. Today, feedlots with capacities in excess of one hundred thousand head are not uncommon.

The use of confinement feeding technology is just one facet of modern agribusiness to facilitate the disconnect between soil, crops, and manure. Smaller diversified farms could utilize farm-grown crop residues and animal manure. Large grain farms rely on off-farm inputs for fertility, however, and never see the manure that results from the feeding of their corn. This disconnect has turned a once valuable source of fertilizer into at best "waste" and at worst, a pollutant. Nitrates and phosphates from commercial fertilizers and runoff from manure piles in feedlots account for a very large proportion of agricultural pollution to surface and ground water.

Sustainable agriculture is a biologically supported production system based on natural principles that demonstrate a very high degree of system resilience. Sustainable agriculture seeks to establish and maintain agricultural production and distribution systems that are economically viable, ecologically sound, and socially just. For beef and dairy production to be environmentally and financially sustainable, they must of necessity be based on the most renewable resource available to the stock grower: grasses, legumes, and other edible plants and the ecological system that supports them.

Pasture-based production systems can be inherently resilient to market price fluctuations due to a reliance on renewable pasture. This is exemplified by farmers, ranchers, and graziers who see themselves as having become principally grass farmers who produce beef or milk only secondarily. Under this model cattle become grass-harvesting tools used to maintain pasture health and to provide meat and milk for the market. Producers rely on this naturally low-input system where feed costs are reduced, animal health is maximized, and a wholesome product is provided to the public. Consumers are becoming more demanding that agricultural products are carefully produced, with concern for soil and water, crops and animals, and the people who work in production and processing.

Consumer Perception and Market Demand for Different Kinds of Beef and Dairy Products

The demand for pasture-finished beef, natural beef, and organic beef is growing in the United States, as is the demand for organic and pasture-raised milk and cheese products. In fact, demand for natural and organic milk and meat outstrips supply in most U.S. markets, as evidenced by processors, marketers, and suppliers seeking grass-fed products from South America. Pasture-finished, natural, and organic food sales have increased from $5.5 billion in 1997 to $12 billion in 2002, a 24 percent annual growth rate. Meat comprises 21 percent of the overall U.S. retail food market. Pasture-finished, natural, and organic meat's share of the market is at 5 percent. Continued growth in demand for these meat products is expected, including direct, local sales of carcasses and retail cuts to families via farm visits, farmer's markets, and by mail-order. Many market analyses suggest the possibility of a viable market well into future years.

Currently the demand for organic and pasture-based dairy products is greater than supplies, as many processors fall short of milk each week by hundreds of thousands of pounds. Organic milk prices at the farm, which at the time of this writing approach $25 per cwt (hundredweight) in some areas, are an enormous incentive for many small and medium size dairy producers not able to compete in the conventional milk market. Current prices range from $11 to $15 per cwt in some areas.

For more information on consumer demand issues in meat and milk marketing, see the Agricultural Marketing Resource Center's Web site at *www.agmrc.org/agmrc*.

Pasture-Appropriate Animals for Sustained Cattle Production

Matching the right animal or plant with the appropriate environment is a wise management decision that leads to healthy animals and a productive and successful farming system. Ecological farmers know that organisms adapted to the climate and habitat do much better than those placed into situations nature might not have intended. Selecting the right genetics for pasture-based production is therefore of utmost importance.

Beef Cattle

In general, you want an animal that combines maternal traits like milking ability with early maturity and tenderness. These three traits are important because a cow must calve on pasture and raise a thrifty calf that lays down fat quickly (because growing seasons may be limited). The carcass should yield high quality beef that provides a positive eating experience for the customer. For this reason the moderate body-type English breeds usually fit best with grass operations. However, it is important to remember that there is wide variability in the expression of the traits important for pasture based systems, even within breeds. Select for particular production traits in breeds such as Angus, Hereford, Shorthorn, and other, rarer breeds such as Devon, Dexter, and American Low-Line.

Breeds of importance in the humid south are Brahman and Brahman-cross composites, such as Beefmaster, Santa Gertrudis, Brangus and Braford. Brahman cattle are very tolerant of heat, humidity, and parasites, and have excellent maternal traits. However they do not have the carcass characteristics and marbling that consumers have come to expect. For this reason most producers in the humid south keep the Brahman influence in their cow herd to three-eighths or less and no more than one quarter Brahman breeding in terminal calves.

Dairy Cattle

The dairy industry in the U.S. has been under very intensive consolidation and industrialization pressure to maximize the efficiencies that come with large-scale production. Since the 1950's, dairy farms have been getting bigger, and have been relying on harvested grain and forages to provide high quality feedstuffs to support enormous milk yields. Modern Holsteins can produce more than 60 pounds of milk per day, and many farms report herd averages in excess of 20,000 pounds per lactation.

According to the American Livestock Breeds Conservancy, grass-based dairy farming is on the increase, and this necessitates a very different type of animal. Low-cost, grass-based dairies often cannot support the high nutritional requirements needed by large-framed, high producing cattle. Grass-based dairy producers are utilizing Ayrshire, Brown Swiss, and Jersey for their ability to maintain condition, milk production, and reproduction on forage. These cattle are typically smaller-framed and have lower nutrient requirements than Holsteins. Again, there is wide variability in the expression of the

Selecting Animals for Pasture-Based Production

Select animals from herds that have mature weights under 1,100 pounds, as these will most likely finish at the proper time. Pasture-finished beef cattle are usually marketed between 16 and 24 months of age. Selecting body type is more important than breed type for pasture-based operations. The following qualities should be selected for in animals, including herd bulls:

1. dual-purpose breed types (for beef)
2. medium frame
3. end weight 900 to 1,100 lb
4. age at slaughter 16 to 24 months (for beef)
5. early maturing
6. low maintenance requirements
7. high milk protein and butterfat (for dairy).

traits important for pasture based systems, even within dairy breeds. A good example is the Holstein genetics being developed through selection by grass-based producers in New Zealand.

For more information on livestock breeds see the Oklahoma State University Animal Science Web site at *www.ansi.okstate.edu/breeds*. Information on rare breeds can be found at the American Livestock Breeds Conservancy Web site at *www.albc-usa.org/index.htm*.

Cattle Nutrition

Cattle require consistent sources of protein, energy, minerals, vitamins, and water to maintain productivity and health. For detailed information on ruminant physiology and nutrition contact ATTRA at 800-346-9140.

Adequate energy concentration in the diet allows cattle to utilize other nutrients such as protein, vitamins, and minerals.

The producer can determine an overall picture of the nutritional status of the herd by:

- using body condition scores
- assessing pasture condition
- soil and plant tissue testing to determine mineral and nutrient content (with subsequent appropriate supplementation)

The following section highlights some of the nutrients important in cattle production.

Energy

Feed intake is regulated by an animal's energy needs. Therefore, energy should be considered first when attempting to balance animal diets. Adequate energy concentration in the diet allows cattle to utilize other nutrients such as protein, vitamins, and minerals.

Some of the major determinants of an animal's energy requirements are:

- weight
- body condition score
- milk production
- rate of growth
- level of activity
- impacts of climate (heat, cold, humidity, etc.)

The energy requirements of growing or lactating cattle can be met with fresh pasture or with high quality grass-legume hay in the winter. However energy supplementation on pasture is often effective in maintaining high gains and milk production. Dry cows can subsist on lower quality feedstuffs, but must be maintained at an acceptable body condition score in order to be successfully bred and deliver a healthy calf.

Energy is important for cattle on high protein pasture. The microbes that occupy the rumen need energy to digest all the protein being ingested by the animal. If the microbes do not get enough energy, protein is converted to urea and is passed through urine. For very high producing cattle like growing steers and lactating cows, an energy supplement such as grain can result in better protein digestion, and therefore higher milk production and greater weight gains. Most dairy graziers who supplement their cattle provide from 8 to 18 pounds of corn per head per day, depending on the quality of the pasture, in addition to free choice forage or pasture.

Forages have the ability to supply all the energy needed to maintain highly-productive cattle throughout the growing season, but only when managed intensively. A legume-grass pasture will easily have a protein content greater than 18 percent and high digestible energy during the vegetative stage. As plants mature, the nutrient value lowers. Consider getting your forage analyzed to determine nutrient content and concentration. Your local Cooperative Extension office can assist in sampling forage.

For more specific information on grazing nutrition see the **Further Resources** section below.

Protein

Cows generally require crude protein in the range of 7 to 14 percent of daily dry matter intake. Dry cows require less, and pregnant and lactating cows, especially dairy cattle, require more. Growing cattle, including replacement heifers and steers, require

from 10.5 to 14 percent of their daily dry matter intake to be protein. Approximately two pounds per day is a rough average if supplementing protein concentrate.

Minerals and Vitamins

The principal minerals of concern for cattle on growing forages are calcium and magnesium. Others to consider are salt, phosphorus, potassium, and sulfur. These minerals are very important for cellular respiration, nervous system development, protein synthesis and metabolism, and reproduction. Vitamins are important for the formation of catalysts and enzymes that support growth and body maintenance in animals. Vitamin A is an important supplement for grazing animals. Vitamin A supplementation should be included in the mineral mix at about 1,200 to 1,700 IU's (International Units) per pound of dry matter of feed intake per day. Green forage, high quality hay, and cereal grains are typically high in vitamin E. Mineral and vitamin supplements are available in many formulations. Because soils differ in mineral content from place to place, a recommended mineral mix that works in all places is not possible. Check with your local Extension agent or veterinarian to determine the mineral and vitamin mixes and recommendations common to your area.

Water

Cattle require from three to thirty gallons of water per day. Factors that affect water intake include age, physiological status, temperature, and body size. A rule of thumb is that cattle will consume about one gallon of water per 100 pounds of body weight during winter and two gallons per 100 pounds of body weight during hot weather. In general, double the estimates for lactating cattle. Water should be clean and fresh. Dirty water decreases water intake. Remember that all other nutrient metabolism in the body depends on water, and if a cow stops drinking, nutrient metabolism (growth and lactation) will decrease.

Health and Disease Management

Cattle health management is a disease prevention strategy that includes:

- fostering natural immunity in animals by increasing animal and plant biodiversity on the farm
- balancing nutrition through pasture grazing management and mineral supplementation
- reducing animal stress through appropriate facility design and pasture exposure
- providing high quality forage in the dormant season

The natural living conditions of pastures decrease animal stress and remove unnecessary burdens on the immune system. Other practices such as sanitation, quarantine of new animals, and the use of probiotics in young animals can also foster a healthier environment for livestock. Disease prevention is the best health plan for your herd, and a well-planned pasture-based system effectively eliminates many disease vectors and alleviates many nutritional disorders.

Calves that are weaned, castrated, dehorned, and inoculated, and then sent to a drylot to eat unfamiliar hay and grains are subjected to many simultaneous stresses. They become particularly prone to respiratory infections. However, calves that are castrated early, naturally dehorned with a polled bull, and weaned on grass, tend to be healthier and achieve a gain weight much more rapidly than do conventionally weaned counterparts.

Disease

Disease is a condition that usually occurs when an infectious agent comes in contact with an immunocompromised host. Stress factors usually underlie compromised immune

systems. Stress factors in beef cattle production include hunger, heat, cold, dampness, wind, injury, fatigue, and rough handling. Infectious agents include viruses and bacteria which cause many of the following disease conditions. For more detailed information on cattle diseases, refer to your local county Extension agent. Many state Cooperative Extension services offer free publications on the diseases endemic to your area. The Merck Veterinary manual is also a very good reference on animal diseases, prevention, and treatment. Refer to the **Resources** section for information to obtain a copy. The following section highlights some of the diseases and disorders a producer should keep in mind when considering a pasture-based beef or dairy operation. Producers should cooperatively develop a herd health plan with the local veterinarian.

Consumers who purchase and eat pasture-fed beef can be more confident that the products are free from infectious agents that might compromise human health.

Mastitis

Mastitis is a bacterial infection of the mammary glands caused by contaminated bedding, teat trauma, flies, or the use of hoses in the milking parlor to clean udders. An abnormal discharge from the teats confirms a diagnosis. This can range from off-colored milk to a white, yellow, or red, viscous pus-like discharge. In advanced cases the infected udder quarter will become very hard and milk production declines. Treatment consists of antibiotics in conventional herds, and homeopathic infusions and ointments for organic herds. Cattle producers can minimize the incidence of mastitis through sanitation, avoidance of mud and manure on the udder, pasture-feeding and calving, and maintaining the cattle on a high plane of nutrition. Some organic producers treat infected cows with antibiotics and cull them from the organic herd to maintain organic integrity. For more information on organic mastitis treatment, see Paul Dettloff, *Alternative Treatments for Ruminant Animals* in the **Resources** section.

Bovine Spongiform Encephalopathy

BSE (called Mad Cow Disease by some) is a brain-wasting disease affecting cattle. It is closely related to a human variant called Creutzfeldt-Jakob Disease (vCJD), and is thought to be caused by an abnormal protein called a prion that infects the nervous system and causes behavioral changes, loss of coordination, trembling, and ultimately death. BSE was first reported in Great Britain in 1986 and has been associated with the feeding of animal by-products, specifically nervous system tissue, in cattle rations. Since the prions are found only in an infected animal's nervous system, transmission is thought to be limited to ingestion of nervous tissue.

Prevention of contamination is the only known method to maintain a BSE-free herd. The USDA has instituted a BSE control program that focuses on three key efforts:

1. banning and restricting imports of cattle and cattle products
2. banning the use of animal by-products in cattle feed
3. testing of cattle in the U.S.

Producers of organic and 100-percent pasture-finished beef may have an advantage from a livestock and human health perspective in that animal by-products are fed at no time during the animal's life. Consumers who purchase and eat pasture-fed beef can be more confident that the products are free from infectious agents that might compromise human health. More information on BSE can be found at the USDA Animal Plant Health Inspection Service (APHIS) newsroom Web site *www.aphis.usda.gov/newsroom/hot_issues/bse.shtml*.

Calf Scours

Calf scours occur when a calf is born with (1) limited immunity, and/or (2) introduced into an environment conducive to microbial (viruses and bacteria) infection. It is considered a management disease and can be prevented by taking care of the cow prior to birth and the calf after birth. Scours are usually expressed as diarrhea, skin elasticity from dehydration, weakness, loss of nursing reflex, and a drop in core body temperature. When administered soon

enough, fluid rehydration, electrolytes, and drenching with probiotics can save a stricken calf. It is critically important to rehydrate the calf as soon as signs of infection become evident.

Some principle factors that predispose a calf to scours are:

- inadequate colostrum within first 12 hours (low immunity)
- dirty calving environment (supports microbial contamination)
- inadequate nutrition of the dam (the cow should have a Body Condition Score of 5 at calving)
- calving difficulty
- cold stress, and
- high cattle density on calving grounds

Managing calving such that these factors are minimized lessens the chances that calves become sick. Many producers credit pasture-based systems (and adjusting the calving season to occur when temperatures are warmer and grass is available) for reducing incidents of scour. An environment conducive to animal health can reduce or even completely eliminate calf scour problems. Cows benefit from calving on green pasture by:

- having access to high-quality growing forage, and
- calving in a warmer environment which reduces stress on the calf's immune system

Plant Toxicity

Graziers must pay careful attention to the negative health effects that certain plants can cause in livestock. Some of the more common and economically important disorders are:

- bloat
- grass tetany
- prussic acid
- nitrates
- fescue toxicosis, and
- poisonous plants

Your Local Cooperative Extension office

Contact your local Cooperative Extension office for information on poisonous plants, forage nitrate testing, and locally adapted forages. The USDA maintains an online database of local Cooperative Extension offices on its website at *www.csrees.usda.gov/Extension/index.html*. The phone number for your Cooperative Extension office can be found in the county government section of the local telephone directory.

These conditions are covered in detail in the ATTRA publication *Pasture, Rangeland, and Grazing Management*, available by calling 800-346-9140 or online at *www.attra.ncat.org*. Other good sources of information on plant toxicity are your local Cooperative Extension office (see box) and the book Southern Forages (see Ball in the **Resources** section below for more information).

Internal and External Parasites

Internal parasites are a problem in many parts of the United States, notably those in warmer, more humid regions such as the South and East. Parasitism is manifested in cattle by:

- reduction in milk production
- weight loss
- lowered conception rate
- rough coats
- anemia, and
- diarrhea

The first line of defense in parasite control should be to maintain optimal livestock nutrition. The second line of defense is to enhance immunity through biodiversity on the farm. Finally, a third line of defense is to establish specific management strategies that can reduce the incidence of parasitism. These strategies include:

- pasture rotation
- planned grazing
- dragging or clipping pastures
- multi-species grazing, including poultry
- monitoring with fecal samples, and
- barn sanitation

Sustainable and organic producers have come to recognize that as animals become adapted to a system, internal parasites cease to be a problem. Good health and natural immunity goes a long way to reduce the incidence of both disease and parasitism.

For more in-depth information, please see the ATTRA publication *Integrated Parasite Management for Livestock.*

A Word on Paracitacides

Beef producers have historically relied on paracitacides (chemical dewormers) to combat parasitic pests such as the brown stomach worm, which can cause significant health and economic damage to a cow herd when infection is severe. A common practice is to alternate applications of different paracitacide products to reduce the chance that the parasites will become immune to a particular treatment. Many injectable and pour-on types of paracitacides are available. Many dewormers are not biodegradable and remain active in manure. These products become a part of the pasture environment, and several kill dung beetles, and may have other unintended side effects as well. If you plan to use a dewormer, your veterinarian can recommend an appropriate application schedule for your area.

Vaccination against disease is an accepted practice in modern cattle production, including organic production.

Organic producers' use of synthetic treatments is restricted to breeder stock cattle before the last third of gestation but not during lactation of organic progeny, and to milk animals at least 90 days before milk production (NOP 205.238(b)(1-2)).

Vaccines

Vaccination against disease is an accepted practice in modern cattle production, including organic production, and should complement other preventative health management practices, such as reducing stress, ensuring a balanced ration, and providing pasture as a significant portion of energy needs.

Some natural, pasture-based cattle producers contest vaccination, and assert that providing for the development of natural immunity through farm biodiversification protects animals better than a vaccination regime. Vaccines are seen by these practitioners as a bypass of natural immunity. Regardless, vaccination is a tool that should be carefully considered by the producer and the veterinarian, and is not meant to take the place of good animal management.

Every producer should develop a vaccination program to address the risks of diseases endemic to the region. Consult your veterinarian to determine the types of vaccines recommended for your area. For more information see *General Principles of Vaccination and Vaccines, in Cow-Calf Management Guide* and *Cattle Producers' Library* listed in the **Further Resources** section.

The National Animal Identification System (NAIS)

Animal health issues have become more important in the United States since the discovery of a BSE-positive cow in Washington State in December of 2003. As a result the USDA Animal Plant Health Inspection Service has begun administering the development of a nation wide livestock identification system that will allow officials to track animals to the source in the event of an animal disease outbreak. The plan, called the National Animal Identification System, or NAIS, is composed of a database and tracking system that will be able to "identify all animals and premises that have had contact with a foreign or domestic animal disease of concern within 48 hours after discovery. As an information system that provides for rapid tracing of infected and exposed animals during an outbreak situation, the NAIS will help limit the scope of such outbreaks and ensure that they are contained and eradicated as quickly as possible" (USDA, 2005).

Consumers often cite food safety as among the most important factors that influence their buying decisions. The NAIS was established to address these issues and assure consumers that the meat and milk they consume is wholesome and safe. Consumer confidence in the safety of their food hinges on knowing an animal's complete history, or preserving the identity of

each animal that becomes food. Producers of certified organic products—whether they be crops, livestock or processed products—have always been required to maintain records that can assist the tracking of products from their origin to final sale. Other producers maintain transparent tracking systems through direct marketing relationships with consumers. Although different groups may differ about how that traceability should be documented, most everyone agrees that it is an important issue.

For more information on the National Animal Identification Program see the ATTRA publication *The National Animal Identification System (NAIS): What it is, and how to participate in the process* located at *www.attra.org/attra-pub/nais.html*.

Integrating Cattle into Cropping Systems

Cattle have the potential to give value to cover crops in rotation, where the land might otherwise not yield an economic return. (Bender, 1998) Many farmers utilize legume cover crops in rotation to build soil and increase soil nitrogen for subsequent crops. Cover crops greatly benefit small grain and vegetable yields without the use of soluble fertilizers. However, most cover crops are used as green manures and incorporated into the soil in preparation for subsequent crops. Cattle grazing on legume cover crops can benefit the farm system economically and ecologically. By selling fed steers or custom grazing yearlings, a financial return can be made on the land. Furthermore, through added nutrient cycling (dunging and urine deposition), soil fertility can be enhanced.

If you are considering adding a grazing component to an existing cropping system, note that the cost of electric fencing and water delivery can eat up profits quickly unless these structures are already in place. Consider grazing more valuable animals, such as steers or replacement heifers, instead of cows. Steers and heifers are generally maintained for a short period of time, and you will not have to cover yearly maintenance costs associated with keeping a cow herd. However, raising steers or heifers can require more management skill. For more information on alternative beef enterprises see the **Further Resources** section below.

Before starting a new grazing enterprise, conduct an economic analysis to measure your break-even cost, and determine how many animals it will take to make a profit.

Nutrient Cycling

Grazing cattle will return 70 to 85 percent of the nutrients consumed back to the pasture. When combined with nutrient additions from the dead leaves and roots of pasture plants, nitrogen contributions to nutrient cycling can approach 280 pounds per acre per year in a moderately managed grass/clover pasture. (Bellows, 2001) Pastures with a legume component of 20 to 45 percent are more sustainable than monoculture grass pastures, as the legumes contribute significantly to nitrogen fertility. For more information, see ATTRA's *Nutrient Cycling in Pastures.*

Pastures and Grazing Management

A pasture is "a complex inter-relationship of plant, temperature, light, soil, organisms, nutrients, water, and livestock that make the pasture a continually changing (dynamic) ecosystem." (Murphy, 1995) Pastures are the foundation of sustainable livestock production. They are best maintained by developing a grazing system or plan that conserves the soil and plant resource while maximizing productivity within the natural limits of the particular ecology of the farm.

A grazing system or plan will ration out forage according to animal requirements, allowing full plant recovery while minimizing forage waste. (Murphy, 1995) The elements of a sustainable grazing management system are:

1. proper timing of grazing (corresponding to plant physiological stage)
2. proper intensity of grazing (duration on the pasture)
3. residue or plant height after grazing
4. plant recovery time after grazing
5. adaptive management of grazing time depending on pasture recovery rates (i.e., time on a paddock may double during less productive times of the year, or consideration of summer slump of cool-season grasses and fall decline of warm-season grasses.

Grazing systems best suited to the aforementioned elements are those that employ a rotation where animals are placed on a paddock at high density and moved to another paddock at the appropriate time. Most rotational grazing systems utilize ten or more paddocks to best achieve the benefits of the system. This type of rotational grazing has been called planned grazing, controlled grazing, management-intensive grazing, and intensive rotational grazing. Whatever the name, the main point of this system is that it allows for more effective forage use by increasing forage quality and decreasing grazing selectivity.

A common sight in every region of the country is a pasture full of cows, sheep, or horses and not a blade of grass in sight. The pasture might be green, but the grass is cropped so close it resembles a pool table, and thistles are the tallest plant in the field. This condition, called overgrazing, occurs when the grazing pressure exceeds the carrying capacity of the pasture. Many times we are tempted to assume the culprit to be too many animals on the pasture. However, overgrazing is the result of time on pasture, not grazing intensity. In other words, overgrazing is caused by allowing animals, whether many or few, to remain on a pasture for too long.

A grazing system will permit (1) moderate defoliation, and then (2) allow time for regrowth. If either one of these points is missing, an overgrazed pasture is the likely result. There are a great many well-prepared resources available to assist producers in designing and implementing a controlled grazing system. For more detailed information on pastures and grazing management, contact your local or state Cooperative Extension office. In addition, ATTRA offers the following publications: *Paddock Design, Fencing, and Water Systems for Controlled Grazing; Rotational Grazing; Nutrient Cycling in Pastures; Assessing the Pasture Soil Resource; Pastures: Sustainable Management; Managed Grazing in Riparian Areas*;

and *Pasture, Rangeland, and Grazing Management*. See also the **Further Resources** section at the end of this publication for more books and Web sites on pastures and grazing management.

Organic Cattle Production

The production of organic livestock products is based on four fundamental criteria:

- soil—a healthy, functional soil is the basis of organic agriculture
- health—plants and animals acquire natural immunity through the symbiotic relationship that occurs on diversified farms
- ecological diversity—complexity in pasture plant composition achieves balance and agroecosystem resilience
- organic system integrity—inputs to the system must be approved organic substances. This includes feed, fertility, and pest control inputs.

Conversion to organic production requires the development of an organic system plan, and an organic livestock plan for livestock operations. Organic certification of the land requires a transitional period of three years from the last application of a restricted substance, and yearly inspections and updated applications must be performed to remain in compliance.

The National Organic Program (NOP) Rule states that "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." (USDA, 2006b) In addition, livestock used as breeder stock "may be brought from a nonorganic operation onto an organic operation at any time: Provided, that, if such livestock are gestating and the offspring are to be raised as organic livestock, the breeder stock must be brought onto the facility no later than the last third of gestation." (USDA, 2006b)

There are many excellent resources to assist farmers and ranchers in the transition to organic production. ATTRA's *Organic Certification Process; How to Prepare for an Organic Inspection: Steps and Checklists; Organic Farm Certification & the National Organic Program; NCAT's Organic Livestock Workbook—A Guide to Sustainable and Allowed Practices; National Organic Program Compliance Checklist for Producers; Organic Livestock Documentation Forms;* and *Organic Livestock Production* are available free of charge by calling 800-346-9140 or accessing the ATTRA Web site at *www.attra.ncat.org*.

Slaughter and Meat Processing

Processing includes everything from slaughter to cutting to wrapping and storage. Meat must be processed in a state or federally inspected processing plant, and the plant must be organically certified if the beef is to be sold as certified organic. This, unfortunately, has become a bottleneck in the organic meat industry. There are many farmers and ranchers who can and want to produce organic, and/or grass-fed beef and milk products. As well, there are many customers who would like to purchase sustainably raised animal products. But there remain very few small and medium-size processors who can make the link from animal to retail, especially for small farmers who would like to direct-market their products.

Small and medium-sized processors are particularly hard hit when it comes to government regulation.

Small and medium-size processors are particularly hard hit when it comes to government regulation. Food safety regulations, important as they are, remain heavily influenced by and developed for large-scale meat processors. Small and very small size processors do not have the scale or size to absorb the structural and equipment costs often associated with food safety regulations. Many operate on very tight margins just to stay in business. Small and very small plants make up 90 percent of all federally inspected processing plants in the U.S. According to the USDA, a small plant employs between 10 and 500 people, and a very small plant employs up to 10. Together these two types generate more than $5 million in annual sales. The USDA Food Safety and Inspection Service has a Web site providing outreach information

to small and very small plant operators and can be accessed at: *www.fsis.usda.gov/Science/Small_Very_Small_Plant_Outreach/index.asp.*

An alternative that some producers are developing is the concept of a small, mobile processing plant that can be towed from farm to farm for slaughter and initial cutting. The Lopez Community Land Trust in northwest Washington State has a Web site with information on mobile processors. For more information on mobile processors see the LCLT Web site at *www.lopezclt.org/sard/mpu.html.*

Finally, another issue is that current federal law does not allow beef producers to sell state-inspected processed products into interstate commerce, although there is currently discussion within Congress to redress this issue. Though state-inspected processors need to meet federal standards, this has historically prevented cattle farmers from selling their state-inspected products in larger market areas, which may be just across the state border from where the closest state-inspected processors are located. Generally speaking, there are more state-inspected facilities than USDA-inspected facilities. Fewer USDA-inspected facilities entails higher transportation and processing costs for the beef or dairy producer who ends up having to travel long-distances to get his or her products processed. The mobile processing plant described earlier was developed because, prior to its creation, livestock producers had to transport their product over 300 miles to a USDA-inspected processing facility, making it too costly to garner the added value by having a closer processor.

Milk Quality Indicators

The four primary quality factors for milk are percent protein, percent butterfat, percent lactose, and somatic cell count (SCC). These four measures determine how much a dairy farmer is paid for the milk produced. The biggest constituent in milk is water, so pricing milk based on the concentrations of solids is a better indicator of the value of fluid milk, especially for processors of products such as butter, cheese, and ice cream.

Quality Components of Milk

Breed	Butterfat	Protein	Lactose
Jerseys	4.6	3.6	4.9 – 5.1
Holsteins	3.7	3.0	4.9 – 5.1

Source: *Hoards Dairyman* July 2006 (492)

Somatic cell count—SCC is a measure of white blood cells in fluid milk. High levels of white blood cells in milk indicate infection, such as mastitis, and lowers milk quality. Healthy cows have a SCC lower than 200,000 cells per milliliter. Dairy marketers and processors specify a limit of SCC they will accept.

Antibiotics—The presence of antibiotics in milk is disallowed. Producers who use antibiotics to treat infection must not allow milk from treated cows to get into the bulk tank. In these cases, treated cows are milked after all the healthy cows have been milked, the piping to the bulk tank is disconnected, and the milk is either dumped or fed to suckling calves. Milk containing antibiotics cannot be sold for human consumption.

Marketing Overview

Demand is growing for organic and grass-fed products. However, marketing has been one of the most daunting activities farmers have encountered. For most graziers, learning to market their products requires new skills and considerable time. Some will choose direct marketing venues such as farmers' markets and direct sales, whereas others will opt for cooperative marketing. Becoming a member of a farmer cooperative is very attractive to many farmers, as cooperatives give the farmer the ability to sell products much the same way as in the commodity market, but often with a premium.

Information on dairy marketing can be found in the ATTRA publications *The Economics of Grass-Based Dairying* and *Value-Added Dairy Options.* See also *Dairy Cattle Production* in the **Further Resources** section below. For detailed information regarding alternative marketing of beef products, see ATTRA's *Alternative Beef Marketing*, accessible on the

web at *www.attra.ncat.org*. Also available is SARE's *How to Direct Market Your Beef*, available on the web at *www.sare.org/publications/beef.htm*.

The Social and Ecological Concerns of Cattle Production

One of the tenets of sustainable agriculture is that the system be sustainable from a social perspective. For instance, agricultural systems should address such concerns as animal welfare, human health, land use, and the urban-rural interface. Sustainable agriculture is concerned with the relationships and connections between farms, communities, and the consumers that support them. The soil is the basis from which life is maintained, and establishing a reconnection between consumers and the land is a very important aspect of ecological agriculture. It is for this reason that the farm's ecology is often extended to include towns, watersheds, and cities. Other issues that can be addressed by re-evaluating agriculture from a position of social sustainability are:

1. Processing, farm supplies, local food systems, etc.—In what ways do local farms work with local processors and retailers? How are inputs produced and distributed within a region? Do consumers have access to locally produced foods? Are consumers educated about local food issues? What about the workers in animal processing plants? Do they receive a living wage? Do they receive benefits? Are they protected from health hazards and risks of injury?
2. Antibiotic, feed additives, growth promotants, and pesticide use in cattle production—What are the consequences of chemical use in animal agriculture? What are the social and biological implications of antibiotic resistance? Does the production system respond to market signals that favor natural or organically produced products?

If social issues such as land use, community development, and local food system issues are the question, sustainable cattle farms and ranches are an integral part of the answer. A farm that sees its ecological borders extended beyond the fenceline will necessarily involve the community, and will seek opportunities to build community through its production, education, and marketing efforts.

In a time when livestock farming is under serious scrutiny it is important to consider the impacts of livestock production in riparian areas, on public lands—including Forest Service and BLM lands—and at the urban-rural interface. Livestock production is coming under fire from many advocates of environmental change, who see historic cattle raising as injurious to sustained, much less improved, environmental integrity. While these groups question the legitimacy of cattle production, whether it is grazing on public land or issues dealing with animal rights and welfare, it becomes imperative that farmers, ranchers, citizens, and policy-makers become informed and educate others about the reality of the ecological impacts of animal agriculture.

Domestic cattle do leave a large ecological footprint, especially in environmentally sensitive areas. Desertification in parts of Africa and rangeland decline in the American West are but two obvious examples. Rangeland managers and animal scientists have begun to understand more about the ecology of sensitive lands, and have attempted to describe a history that involved grazing animals in the evolution of perennial grasslands. Many have proposed that the real cause of inefficient or even deleterious use of rangeland is simply mismanagement. If cattle are fenced into a particular ecosystem and overgraze, they place an inordinate pressure on the system it cannot support. The result is a forced shift in plant community away from diversity, complexity, and stability and toward one that is simplistic and unstable. Such a community is inherently unable to cope with ecological, climatic, or biological change. To counter this trend, it is imperative that scientists and land managers foster an understanding of the principles of animal behavior and build production systems that mimic natural systems as much as possible.

Sustainable agriculture is concerned with the relationships and connections between farms, communities, and the consumers that support them.

Many progressive farmers and consumers believe pasture-based cattle production is more ecologically sustainable than conventional, grain-finished, confinement-oriented cattle production, for both beef and dairy products. Conventional beef and dairy production relies on harvested grain as the primary feed source. Conventional agriculture, for all its productivity and cheap food, is by definition not concerned with resource conservation and environmental stewardship. In fact, the conventional paradigm is inconsistent with agricultural sustainability by its very nature.

Pasture-based production systems, however, have the inherent ability to support, stabilize, and maintain ecological systems for increased, sustained, efficient food and fiber productivity. Some of the ecological benefits of pasture-based livestock production are as follows:

1. Development and maintenance of soil organic matter and effective nutrient cycling.
2. Maintenance of efficient water cycle with perennial grass and forb ground cover and subsequent soil structural stability and increased organic matter.
3. Reduction in tillage associated with annual cropping (corn, wheat, barley), which reduces organic matter and water conservation.
4. Reduced animal confinement, which reduces nutrient problems and allows manure to become a fertilizer instead of a pollutant.
5. Reduced annual cropping, which lessens the amount of fossil fuel energy required to produce and transport feed for confined cattle. There is an unnecessary amount of energy used to produce a unit of beef protein or milk, whereas it is much more energy-efficient for the animal to harvest food itself.
6. Reliance on compost and manures for nitrogen fertility, which results in reduced synthetic fertilizer applications and use of fossil fuel energy for manufacture and application. These practices do not contribute to long-term soil development and maintenance, but merely feed the plants at a particular point in time.
7. Pasture plant diversity which builds soil structure, occupies all available niches, and effectively competes for space and nutrients with noxious and invasive species.

Photo courtesy of USDA-NRCS.

Final Thoughts

At the time of this writing, the pasture-based cattle production industry does not have a standard such as is found in the National Organic Program (NOP) regulations. The USDA is, however, considering a "USDA Grass-fed" label for animals that are fed at least 99 percent of their diet on pasture. Grass-finished beef and grass-fed dairy products reportedly have many health benefits compromised when an animal is fed even a small amount of grain, even after being on grass since calfhood. Given the market prospects and positive human health and animal welfare attributes, pasture based systems would seem to be the production method of choice for a society engaged in seeking sustainable solutions to the problems inherent in conventional agricultural production.

Whether pasture-based beef and dairy systems can become viable as a mainstream production, processing, and distribution system in the United States remains to be seen, however. Given the realities of large

scale marketing and distribution, small and medium-size operations are at an extreme disadvantage. Niche marketing remains the most viable option for many producers. For some, joining a cooperative such as Organic Valley or the Organic Grassfed Beef Coalition can be a way to market specialty cattle products to larger markets.

In addition, the question has been rightly raised whether the U.S. possesses enough acreage and the associated yearly forage production to sustain a pasture based livestock system. More research is required to address these questions.

Sustainable livestock farming and ranching depends on the producer's practical knowledge of a particular piece of land. This is true of any farming enterprise that claims to be truly sustainable. Such practical knowledge is really the manifestation of an intimate relationship with the land; a sense that the land is more than just a foundation from which to engage in an economically profitable enterprise. The land is in a very real sense a living system, abounding in complex and fruitful relationships between soil and soil organisms, plants, water, animals, and people. This agro-ecology that farmers and consumers find themselves in, of which they are very much an integral part, is the basis from which true agricultural knowledge is derived. Agricultural sustainability can be realized only by understanding animals, pastures, crops, markets, and homelife from this holistic perspective.

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USDA. 2006a. National Animal Identification System (NAIS) website. APHIS. *http://animalid.aphis.usda.gov/nais/index.shtml.*

USDA. 2006b. National Organic Program Standards. Agricultural Marketing Service. *www.ams.usda.gov/nop/indexIE.htm.*

Resources

ATTRA Publications

Assessing the Pasture Soil Resource

Beef Farm Sustainability Checksheet

Beef Marketing Alternatives

Dairy Beef

Dairy Farm Sustainability Checksheet

Dairy Resource List: Organic and Pasture-Based

The Economics of Grass-based Dairying

Grass-Based and Seasonal Dairying

Grazing Networks for Livestock Producers

Grazing Contracts for Livestock

Managed Grazing in Riparian Areas

Multispecies Grazing

Nutrient Cycling in Pastures

Pastures: Sustainable Management

Pastures: Going Organic

Paddock Design, Fencing, and Water Systems for Controlled Grazing

Raising Dairy Heifers on Pasture

Rotational Grazing

Value-added Dairy Options

Forage, Pasture, and Rangeland Management

Alberta Forage Manual
Alberta Agriculture, Food, and Rural Development Publication Office, 7000 - 113 Street, Edmonton, Alberta, Canada T6H 5T6, 800-292-5697
http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/agdex16

Fertility Pastures by Newman Turner
Faber and Faber, 24 Russell Square, London
Classic text on herbal lays, soil health, and profitable livestock production on pasture. Out of print. Used bookstores and interlibrary loan might yield good results obtaining this worthwhile book.

Forage Information System
http://forages.oregonstate.edu/index.cfm
A comprehensive website for forage-related topics, including publications, educational opportunities, and professional resources. Maintained by Oregon State University.

Grazing Systems Planning Guide
Kevin Blanchet, University of Minnesota Extension Service, Howard Moechnig, Natural Resources Conservation Service, Minnesota Board of Water & Soil Resources, Jodi DeJong-Hughes, University of Minnesota Extension Service, University of Minnesota Extension Service Distribution Center, 405 Coffey Hall, 1420 Eckles Avenue, St. Paul, MN 55108-6068
order@extension.umn.edu
Delineates the components of a grazing system by taking the farmer through the grazing management planning process. The guide can be viewed or downloaded at www.extension.umn.edu/distribution/livestocksystems/DI7606.html.

Intermountain Planting Guide
USDA Agricultural Research Service, Utah State University, Logan, Utah
Order from USU Extension Publications
http://extension.usu.edu/cooperative/publications
435-797-2251

Management-Intensive Grazing: The Grassroots of Grassfarming, Jim Gerrish, Green Park Publishing
This book can be obtained through The Stockman Grassfarmer's Bookshelf at 800-748-9808. The industry-standard for growing and managing pastures for sustained livestock production.

Missouri Grazing Manual
James R. Gerrish, College of Agriculture, Food and Natural Resources, Craig A. Roberts, College of Agriculture, Food and Natural Resources,
Order from University of Missouri Extension publications, 573-882-7216, *http://muextension.missouri.edu/explore/manuals/m00157.htm*
This manual is designed to acquaint readers with the principles on which successful grazing management is based. This manual brings together a group of researchers, educators and producers with broad experience in land management and forage/livestock systems to provide a comprehensive guide to understanding and managing grassland ecosystems.

Rangelands West
Western Rangelands Partnership, Agriculture Network Information Center, University of Arizona
http://rangelandswest.org
Web-based educational tools and information to assist resource managers improve rangelands and maintain sustainability.

Pastures for profit: A guide to rotational grazing
Cooperative Extension Publications, 45 N. Charter St., Madison, WI 53715, *http://learningstore.uwex.edu*
Grazing ecology, and setting up a rotational grazing system.

Ecology and Ecosystem Management

Behavioral Education for Human, Animal, and Ecosystem Management, *www.behave.net*
Applying behavioral principles in ecosystem management.

Foraging Behavior: Managing to Survive in a World of Change; Behavioral Principles for Human, Animal, Vegetation, and Ecosystem Management,
Fred Provenza, PhD, Utah State University
www.behave.net/products/booklet.html

Grazing Management: an Ecological Perspective
by Rodney K Heitschmidt and Jerry W Stuth,
Available on the web at *http://cnrit.tamu.edu/rlem/textbook/textbook-fr.html*
This book was written to help resource managers broaden their perspective relative to management of grazing animals and heighten their awareness of the role they play in maintaining the integrity of ecological systems (from the Foreward). Published by Timber Press, Portland, OR

Holistic Management International
1010 Tijeras Ave. NW, Albuquerque, NM 87102
505-842-5252, *hmi@holisticmanagement.org, www.holisticmanagement.org*

HMI is a goal-oriented decision-making system for ecological management of resources, people, and capital.

Stockmanship: Improving rangeland health through appropriate livestock handling. Steve Cote, P.O. Box 819, 125 So. Water St., Arco, ID 83213, 208-527-8557, or available on the web at: *www.mt.nrcs.usda.gov/technical/ecs/range/stockmanship.html*

Order from the Natural Resources Conservation Service, and the Butte Soil and Water Conservation District

Quivira Coalition
1413 Second Street, Suite 1, Santa Fe, NM 87505, 505-820-2544, *www.quiviracoalition.org/index.html*

Publications on ecological resource management including range management, grazing, road construction, monitoring, and managing resources at the urban-rural interface.

Cattle Nutrition, Health, and Production Management

Beef Cattle Resources
Virtual Livestock Library, Oklahoma State University
www.ansi.okstate.edu/library/cattbeef.html

Cow-Calf Management Guide and Cattle Producer's Library (CD and print), developed by the Western Beef Resource Committee, produced by the Animal and Veterinary Science Department
College of Agricultural and Life Sciences
University of Idaho, Moscow, ID 83844-2330
208-885-6345, *www.avs.uidaho.edu/wbrc*

Merck Veterinary Manual
Merck Publishing Group, Merck & Co., Inc., P.O. Box 2000 RY84-15, Rahway, NJ 07065,732-594-4600, *www.merckbooks.com/mvm/index.html*, *www.merckvetmanual.com/mvm/index.jsp*

Online text version is an authoritative reference for animal health, disease, and management information.

Dairy Cattle Production

Dairy Farm Manual
Washington State Department of Agriculture Food Safety & Animal Health Division, P.O. Box 42560, Olympia, WA 98504-2560, 360-902-1875
http://agr.wa.gov/foodAnimal/Dairy/DairyFarmManual.htm

Information to assist dairy producers in meeting the inspection requirements for Grade A dairies in Washington.

The Economics of Organic and Grazing Dairy Farms Regional Multi-State Interpretation of Small Farm Financial Data from the Fourth Year Report on 2003 Great Lakes Grazing Network Grazing Dairy Data. Madison, WI: UW Center for Dairy Profitability.
Kriegl, T. 2005.
Fact Sheet #1: Project Overview
Fact Sheet #2: Comparing the Top Half with the Bottom Half of Graziers
Fact Sheet #3: Comparing Herds by Size. Less than 100 Cows vs. 100 Cows or More
Fact Sheet #4: Comparing Seasonal Calving with Non-seasonal Herds
Fact Sheet #5: Grazing vs. Confinement Farms.
Fact Sheet #6: Preview of Financial Performance of Graziers by Breed
Contact: Tom Kriegl at 608-263-2685 or 277 Animal Sci Bldg, 1675 Observatory Dr., Madison, WI 53706. *http://cdp.wisc.edu*

Comprehensive research project comparing conventional and pasture-based dairy farms in the Midwest. An excellent resource for dairy farmers considering a transition to organic and/or pasture-based production.

Missouri Dairymen's Resource Guide
University of Missouri Extension,
http://agebb.missouri.edu/dairy

Links to online dairy resources including feeds, labor, business management, grazing, dry cow management, health and reproduction, facilities, and nutrient management.

Northeast Organic Dairy Producers Alliance
30 Keets Rd, Deerfield, MA 01342,
www.organicmilk.org/index.html

Nutrient Requirements of Dairy Cattle:
Seventh Revised Edition, National Academy of Sciences, Washington, DC. 2001, *http://newton.nap.edu/catalog/9825.html*

The NRC nutrient requirements were developed from studies on cattle fed concentrates and harvested forages in confinement, and may not reflect grazing nutrition. However, it can be a useful starting place in balancing developing pasture-based diets. Includes feedstuff charts with nutrient contents.

Organic Dairy Farming: A Resource for Farmers (2006), Jody Padgham, editor, Midwest Organic and Sustainable Education Service, P.O. Box 339, Spring Valley, WI 54767, *www.mosesorganic.org*, 715-772-3153

A comprehensive resource that covers organic production from nutrition to marketing, including a resource list and farmer profiles. The most up-to-date resource available, from Midwest Organic and Sustainable Education Service.

Pasture for Dairy Cattle: Challenges and Opportunities
Donna M. Amaral-Phillips, Roger W. Hemken, Jimmy C. Henning, and Larry W. Turner, University of Kentucky Cooperative Extension, *www.ca.uky.edu/agc/pubs/asc/asc151/asc151.pdf*

Prescribed Grazing and Feeding Management for Lactating Dairy Cows
Darrell Emmick, editor, New York State Grazing Lands Conservation Initiative, 2000 USDA-NRCS, Syracuse, NY

The Small Dairy Resource Book
Beltsville, MD: Sustainable Agriculture Network, Dunaway, V. 2000, *www.sare.org/publications/dairyresource/dairyresource.pdf*

Out of print. Accessible on the SARE Web site. Excellent resources for small scale dairy producers, including processing, food safety, marketing, animal and pasture management, and an extensive list of suppliers, organizations, and publications.

Cornell University Small Farms Program
www.smallfarms.cornell.edu

Excellent resources on value-added dairy production and marketing, including pasture-based and organic. The Resources section of the website has a link to Production Information, with many good publications on developing dairy opportunities.

Dairy Barn and Equipment Plans

Colorado State University Resource Center Dairy Equipment and Housing Plans
http://cerc.colostate.edu/Blueprints/Dairy.htm

Canada Plan Service Dairy Cattle Barn and Equipment Plans
www.cps.gov.on.ca/english/dc2000/dairy.htm

Penn State Dairy Housing Plans—NRAES Publications
www.nraes.org/publications/nraes85.html

Low Cost Parlor Options CD (2001)
Arlin Brannstrom, 285 Animal Science Building, 1675 Observatory Drive, Madison, WI 53706, 608-265-3030, *Brannstrom@aae.wisc.edu*

This CD was developed by the Dairy Modernization/Retrofit Team of the University of Wisconsin Extension in cooperation with the UW Center for Dairy Profitability and the Biological Systems Engineering Department of the University of Wisconsin—Extension. Single copies of the CD may be purchased from the Center for Dairy Profitability for $25.00. This price includes shipping and handling.

Marketing

Agricultural Marketing Resource Center
www.agmrc.org/agmrc

National information service for value-added agriculture. Section on marketing of natural beef located at www.agmrc.org/agmrc/commodity/livestock/beef/beef+natural.htm. *Section on marketing of dairy products located at* www.agmrc.org/agmrc/commodity/livestock/dairy/dairy.htm.

How to Direct Market Your Beef
USDA Sustainable Agriculture Research and Education (SARE) program, 2005.
www.sare.org/publications/beef.htm.

The Legal Guide for Direct Farm Marketing
By Neil D. Hamilton, contact Karla Westberg, The Agricultural Law Center, The Law School, Drake University, 2507 University Avenue, Des Moines, IA 50311, 515-271-2947, *karla.westberg@drake.edu*, *www.statefoodpolicy.org/legal_guide.htm*

An up-to-date, well-written primer on all the legal considerations related to direct marketing of agricultural products. Underwritten by a USDA SARE grant. Includes a chapter on marketing of meat. This publication is available for $20 through the Agricultural Law Center. Please include your name, address, and phone number. Someone will contact you to finalize billing information. Volume discounts may apply.

Beef and Dairy Marketing Coops, Processors, and Firms

Coleman Natural Products, Inc.
5140 Race Court, Suite 4, Denver, CO 80216, 800-442-8666, *www.colemannatural.com*

Dakota Beef, LLC
980 N. Michigan Ave., Suite 1400, Chicago, IL 60601, 312-214-4991, *www.dakotabeefcompany.com*

Laura's Lean Beef
2285 Executive Drive, Suite 200, Lexington, KY 40505, 1-800-487-5326, *www.laurasleanbeef.com*

Organic Family LLC, DBA Organic Choice
251 Industrial Drive, Mondovi, WI 54755, 715-926-478, *www.nextgenerationdairy.com*

Organic dairy processor.

Organic Grassfed Beef Coalition
P.O. Box 125, Vermillion, SD 57069, 605-638-0748, *www.organicgrassfedbeef.org*

Organic Valley Family of Farms, CROPP Cooperative
507 W. Main St., La Farge, WI 54639,

888-809-9297, *www.farmers.coop*
Organic dairy and beef cooperative.

Ozark Pasture Beef
P.O. Box 3005, Fayetteville, AR 72702,
479-283-3411, *www.ozarkpasturebeef.com*

Tallgrass Beef Company
Corporate Mailing Address:
Tallgrass Beef Company, LLC, 103 East Main Street, Suite 1, Sedan, KS 67361, 877-822-8283, *www.tallgrassbeef.com*
Grass fed and finished beef marketing firm.

Grass-Feeding and Grass Finishing

Eat Wild: The clearinghouse for information about pasture-based farming
http://eatwild.com
Comprehensive, science-based information about the benefits of raising animals on pasture.

Grass-Fed Cattle: How to Produce and Market Natural Beef
Julius Ruechel, North Adams, Mass.: Storey Publishing, 2006.
This book is a comprehensive work covering all aspects of pasture-based beef production from a practical standpoint. Well-written and full of anecdotes on the reality of beef cattle farming and ranching, it is a must-have for anyone considering raising and selling sustainably raised beef.

Whole Farm Planning for the Production of Grass-Fed Beef, Ann Wells, Former Technical Services Manager, National Center for Appropriate Technology, P.O. Box 3657, Fayetteville, AR 72702
www.sare.org/reporting/report_viewer.asp?pn=LS00-113
Southern SARE Sustainable Agriculture Research and Education Project #LS00-113.

Livestock Handling

Livestock Behaviour, Design of Facilities and Humane Slaughter, Temple Grandin, PhD, Grandin Livestock Handling System, Inc., 2918 Silver Plume Drive, Unit C3, Fort Collins, CO 80526, 970-229-0703, *www.grandin.com*
Grandin is America's foremost expert in livestock psychology and handling system design. Her Web site is full of resources to assist producers in laying out and building livestock handling facilities with the animal in mind. The Beef Cattle Behaviour Handling and Facilities Design Book (2nd edition) can be ordered from the Web site.

Periodicals

Hoard's Dairyman
P.O. Box 801, Fort Atkinson, WI 53538,
920-563-5551, *www.hoards.com*
America's dairy industry magazine with market reports, health information, and news.

The Forage Leader
American Forage and Grassland Council, P.O. Box 94
Georgetown, TX 78627, 800-944-2342, *www.afgc.org*
A quarterly magazine published by the American Forage and Grassland Council.

In Practice
Holistic Management International, 1010 Tijeras Ave. NW, Albuquerque, NM 87102, 505-842-5252, *www.holisticmanagement.org*
Bi-monthly publication of Holistic Management International.

The Stockman Grass Farmer
P.O. Box 2300. Ridgeland, MS 39158-9911,
601-853-1861, 800-748-9808,
http://stockmangrassfarmer.net
One of the nation's premier publications on the art and science of grass farming. A free sample copy is available.

Graze
P.O. Box 48, Belleville, WI 53508, 608-455-3311,
graze@ticon.net, www.grazeonline.com/index.html
A monthly publication dedicated to promoting the practice of intensively managed grazing.

Rangelands
Online version available at: *www.srmjournals.org/perlserv/?request=index-html* or write to:
Society for Range Management, P.O. Box 1897,
Lawrence, KS 66044
A publication of the Society for Range Management. Scientifically based information in a user-friendly format.

Further Resources

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Case Study: Lasater Grasslands Beef; the Lasater Ranch Philosophy

The Lasater Ranch legacy began in the early twentieth century in south Texas, where Ed Lasater, second generation rancher in the family business, helped turn the region into a productive cattle producing area. In 1948, his son Tom, having developed the Beefmaster breed in south Texas, moved to southeastern Colorado to begin what has become one of the most progressive and innovative ranches in the nation. The family has always been committed to the principles of agricultural sustainability, even before the term, and all it implies, became a part of everyday language. Everything the Lasaters have done has been from the perspective of holism, taking a comprehensive management style that considers each element of the ranching business as a crucial part of a bigger picture. That bigger picture has materialized in recent years in the form of Lasater Grasslands Beef, a subsidiary of the ranch that raises and markets grass-fed beef locally through markets and nationally through a well-developed, informative, and user-friendly website.

The Lasater Ranch occupies 30,000 acres of shortgrass prairie near Matheson, Colorado, sitting at an elevation of 6,000 feet above sea level. As a part of its holistic management philosophy, the ranch uses no pesticides, commercial fertilizers, growth hormones, steroids, or antibiotics in its production system. Instead, managers rely on nature's balance to maintain range and cattle health. For the Lasaters, this means grazing. The shortgrass prairie evolved under the seasonal grazing pressure of bison, whose large numbers would pass through the range, grazing the native grasses and forbs, fertilizing the soil and working it with hoof action, moving as they grazed. This seasonal grazing cycle is mimicked by livestock graziers today who practice controlled rotational grazing. This is usually accomplished with pastures, or cells, divided into small paddocks, which offers the grazier the ability to manage and control livestock numbers and grazing intensity. The Lasater Ranch applies these same principles once again, on a much larger scale, to the range.

Lasater Grassland Beef pastures are managed for range plant vigor, allowing for 70 to 80 days of rest after each grazing event. For a high elevation ranch, this means that some pastures will be grazed only once a year during the growing season. Utilizing the principles of rotational grazing, a pasture is grazed according to grass growth, soil moisture, and plant stubble height after grazing. Native bunch grasses like little bluestem, sideoats grama, switchgrass, and western wheatgrass need to have at least 4 to 6 inches of plant material left after the animals are finished grazing. This puts pressure on Andy Duffy, the ranch manager for Lasater Grasslands Beef, to pay careful attention to how long the cattle stay on a pasture. For Andy, it's crucial that the cattle never take that second bite of a grass plant. Research has shown that continued defoliation of range grasses stresses the plant root systems and causes root mass decline. Without adequate root mass and carbohydrate reserves, the plant will be unable to persist from year to year. When the grass is gone, the weeds move in.

Noxious weeds are a problem on most western ranges, and the Lasater Ranch has its share as well. For example, to deal with leafy spurge in riparian areas, the management has applied the use of goat grazing instead of herbicides that can harm native vegetation. Biological control is also practiced through the release of host-specific insects, such as flea beetles, seed weevils, and stem borers to weaken noxious weeds and take away any competitive advantage. Weed control on rangeland requires an integrated approach to be sustainable and successful, and the Lasater legacy is once again on the leading edge of applying low-input technologies to make ranching profitable and ecologically sustainable.

As stated earlier, part of the ranch's business is marketing. Lasater Grasslands Beef utilizes local, family-owned, USDA inspected processing facilities to kill, cut, and wrap beef products. The products are also available through several grocery and specialty stores in Colorado. This brings economic opportunity to small processors especially. Most of the profit taken in large-scale commercial beef processing is not from the primary cuts, but from by-products like hides and offal. Large-scale industrial processors deal in large volumes and are positioned by economies of scale to take advantage of this economic reality. Small processors cannot reap these same benefits because they don't deal in high volumes. In fact, for small processors, by-products are often more a liability than an asset. Small processors usually end up paying someone to haul off their by-products. Lasater Grasslands Beef is helping local processors overcome these obstacles by supplying them with a ready source of high-quality beef, thereby allowing local economies to flourish by capturing value locally. Lasater Grasslands Beef is proving that grassland and rangeland-based agriculture can not only be financially and ecologically sustainable for the ranch, but socially sustainable for the local community.

The Lasater philosophy is summed up in the slogan: "In Nature's Image." It's an image worth perpetuating in communities and on farms and ranches throughout America. Indeed, throughout the world. More information on Lasater Grasslands Beef can be obtained by logging onto the Web site at *www.lasatergrasslandbeef.com.*

Notes

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