

forage & grassland reference manual



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Forage & Grassland Reference Manual - (2009)

Table of Contents

Section	Subject Title: (Click on a <u>Subject Title</u> to view the listed articles)	Page:
1.0	<u>Forage Species</u>	3
2.0	<u>Forage Establishment</u>	5
3.0	<u>Renovation Forage & Grasslands</u>	6
4.0	<u>Forage Management</u>	7
5.0	<u>Forage Fertility</u>	8
6.0	<u>Forage Diseases & Insects</u>	10
7.0	Harvesting Forage	12
7.1	<u>Harvesting Forage as Hay</u>	12
7.2	<u>Harvesting Forage as Silage</u>	14
7.3	<u>Harvesting Quality Forage</u>	15
8.0	Pasture Management	17
8.1	<u>Grazing Management Systems</u>	17
8.2	<u>Range Management</u>	20
8.3	<u>Pasture Quality</u>	21
8.4	<u>Alfalfa Grazing and Pasture Bloat</u>	22
8.5	<u>Horse Pasture Management</u>	23
9.0	<u>Extended Grazing Systems</u>	24
10.0	<u>Livestock Grazing Facilities</u>	26
11.0	<u>Grass Fed Beef Systems</u>	29
12.0	<u>Livestock Management</u>	30
13.0	<u>Environmental Considerations</u>	32
14.0	<u>Riparian Health</u>	33
15.0	<u>Economics & Marketing</u>	34
16.0	<u>Forage & Grassland References (websites)</u>	36

1.0

Forage Species

(Each Sub-Title has a brief description of the Subject Article)

Click on the [Sub-Title](#) to view the article content

1.1

[*Seed Manitoba 2009*](#)

Forage section Manitoba Agriculture, Food and Rural Initiative; a comparison between varieties of their dry matter yield, nutritional quality, disease resistance of annual forages such as; corn, annual cereals and grasses. A similar comparison to legume and grass varieties available to producers in Manitoba.

1.2

[*2008 MB Forage Adaptation Brochure*](#)

Manitoba Agriculture, Food and Rural Initiatives - a description of all of the major forage species used for seeding in Manitoba including legumes, tame and native grass species. Their characteristics are also listed such as use; longevity; winter hardiness and tolerance to flooding; drought and salinity.

1.3

[*Select Alfalfa Varieties for Manitoba \(2002\)*](#)

Manitoba Agriculture, Food and Rural Initiatives ; some guidelines as to how to select a variety for yield, winter hardiness and disease resistance for hay and pasture use in Manitoba.

1.4

[*Selection of Grasses and Legumes for Manitoba \(2009\)*](#)

Manitoba Agriculture, Food and Rural Initiatives; a review of the characteristics of grasses, legumes and annual forages used in Manitoba and the adaptation and comparative dry matter yields.

1.5

[*Forage Barleys for Manitoba*](#)

Manitoba Agriculture, Food and Rural Initiatives; Description of varieties suited to Manitoba, production zones, disease resistance and comparative yields in Manitoba.

1.6

[*Common Native Pasture Plants of Southern Manitoba*](#)

Critical Manitoba Wildlife Habitat; a review of common plant found on Manitoba pastures, plant characteristics for identification and a score card on assessing a pasture condition.

1.7

[*A Field Guide to Common Seeded Forage Plants*](#)

Saskatchewan Agriculture & Food; plant characteristics for identification of common seeded plants.

1.8

[*2008 Annual Forages for Manitoba \(2008\)*](#)

Manitoba Agriculture, Food and Rural Initiatives; a comparison of the options for annual crops as forage harvested for stored forage or as a grazed crop. Information on seeding date, rates also production tips and feed values

1.9

[*2008 Saskatchewan Forage Guide \(2008\)*](#)

Saskatchewan Agriculture; includes; description of common forages used in Saskatchewan including grasses, legumes and annual crops for forage in the different climatic zones. Tolerance to salinity and flooding are listed. Forage establishment topics include; seeding rates, seeding date, forage mixtures, fertility and legume inoculation. Forage harvesting and grazing management tips are reviewed.

1.10

[*Agronomy of Annual Crops for Forage and Pasture, \(2004\)*](#)

Saskatchewan Agriculture includes cool and warm season options, annuals for fall and winter, seeding and fertility rates, stocking rates and animal health problems associated with grazing annuals.

1.11

[*Golden German Millet production – \(2004\)*](#)

Saskatchewan Agriculture; includes information on description, seeding rates and practices, fertility, weed control, crop management, harvesting options and swath grazing.

1.0

Forage Species (Continued)

(Each Sub-Title has a brief description of the Subject Article)

Click on the [Sub-Title](#) to view the article content

- 1.12. [*Forage Production from Spring Cereals and Cereal-Pea Mixtures \(1999\)*](#)
Ontario Ministry of Agriculture and Food includes information on crop management, cereals species and mixtures with peas. Also information on potential crop yields, harvesting systems and feed value.
- 1.13 [*Annual Ryegrass for Stored Feed and Pasture*](#)
Ontario Ministry of Agriculture and Food; includes information on crop description, planting dates and seeding rates. Also includes information on harvesting dates, yields and feed quality at three crop production sites in Ontario.
- 1.14 [*Forage Sorghum-Sudan Grass \(1999\)*](#)
Ontario Ministry of Agriculture and Food includes information on the crop characteristics of Sudan Grass, Sorghum and Sorghum-Sudan hybrids as annual forage. Seeding rates, fertility, weed control, harvesting as a stored crop and for grazing are reviewed. Feed values and nutritional concerns are discussed.
- 1.15 [*Forage Brassicas \(2004\)*](#)
Alberta Agriculture, Food and Rural Development; includes information on the various Brassicas suited for forage production, establishment systems, seeding rates, fertility and harvesting management
- 1.16 [*Annual forages for Grazing*](#)
Alberta Agriculture, Food and Rural Development; includes an overview of the use of annual crops harvested as stored forage or for grazing as a supplemental feed or for emergency forage. The use of swath grazing to extend the grazing period with annuals is also discussed. Crop yields and feed values are summarized from data from Lacombe and Brooks AB and also Western Beef Development Centre at Saskatoon.
- 1.17 [*Alternative Forage Crops \(2007\)*](#)
University of Wisconsin Extension; a review of the annual forages used in Wisconsin including planting dates, crop yields (Wisconsin data), and comparative feed values of the different crops are reviewed.
- 1.18 [*Brassicas \(1992\)*](#)
Ohio State University Extension; includes a review of the Brassica crops used in Ohio such as; turnips, rutabagas, forage rape, kale, swedes and mustard. There is a discussion of comparative crop yields, feeding, grazing management and nutritional limitations.

2.0

Forage Establishment

(Each Sub-Title has a brief description of the Subject Article)

Click on the [Sub-Title](#) to view the article content

2.1

[*Tips for improving Forage Establishment Success \(2005\)*](#)

Manitoba Agriculture Food and Rural Initiatives; includes a review of options to establish forage crop in Manitoba. The species to use, environmental considerations such as salinity, drought and seed bed problems are discussed as well as seeding dates, depth of seeding, seeding rates, fertility, importance of legume inoculation and the use of companion crops.

2.2

[*Forage Selection and Establishment \(Frequently Asked Questions\) \(2008\)*](#)

Saskatchewan; this includes some general management information on seeding dates, weed control, seeding depth, seed flow through equipment, use of cover crops, fertility required and row spacing. Options for saline soils are also discussed.

2.3

[*Companion Crops*](#)

Foragebeef.ca; this is a review of some general considerations on the use of companion crops when establishing forage stands.

2.4

[*Alfalfa Growth \(1999\)*](#)

North Dakota State University ; the characteristics of seedling germination, growth and vegetative development of alfalfa from information obtain from trials in North Dakota.

2.5

[*Late Fall or Dormant Seeding \(Frequently Asked Questions\) \(2004\)*](#)

Alberta Agriculture; includes the options for fall seeding and the risks involved.

2.6

[*Auto toxicity of Alfalfa \(2004\)*](#)

Wisconsin; this includes a review of some of the factors that result in poor alfalfa seedling establishment when seeded into old alfalfa stands. Research results are discussed as to the period of time between alfalfa crops to reduce the auto toxicity effect.

2.7

[*Air seeders for Seeding Forage Crops \(1997\)*](#)

Prairie Agricultural Machinery Institute; a review of several air seeders common in Western Canada that could be used to seed forage seeds

2.8

[*Forage Legume inoculation*](#)

A review of the importance of inoculating legumes and some very practical methods of effective application of the inoculants.

2.9

[*Legume inoculation techniques*](#)

Some additional ideas on how to effectively inoculate legume seeds.

2.10

[*Frost Seeding - A Cheaper Alternative \(2009\)*](#)

Ontario Ministry of Agriculture and Food (; includes a review of what is involved, time of seeding, the equipment to use, importance of site selection, species to use and seeding rates, fertility and general management.

2.11

[*Forages Establishment worksheet*](#)

Manitoba Forage Council; an Excel worksheet that will help to determine the cost of establishing a forage crop. All cells that are uncoloured may be changed.

3.0 **Renovation Forage & Grasslands**

(Each Sub-Title has a brief description of the Subject Article)

Click on the [Sub-Title](#) to view the article content

3.1 [Sod Seeding booklet](#)

Manitoba Forage Council and Manitoba Agriculture Food and Rural Initiative; this is a 21 page booklet that reviews the techniques that have been used in Western Canada to introduce forage seeds into an existing forage stand.

3.2 [Sod Seeding into Existing Forage Stands](#)

Manitoba Agriculture Food and Rural Initiative; a review of the experiences and practises in Manitoba on introducing new forage seeds into existing forage stands.

3.3 [Manitoba Pasture Rejuvenation Methods \(2007\)](#)

Manitoba Forage Council; a summary of interviews of Manitoba farmers who have used various techniques for interseeding forages into an existing stand – their successes and challenges.

3.4 [Options for Forage Rejuvenation \(2007\)](#)

Manitoba Forage Council; a review of some of the more common techniques used in Manitoba to inter seed forage into existing stands.

3.5 [Sod Seeding Alfalfa \(2002\)](#)

Manitoba Agriculture Food and Rural Initiative - this Fact Sheet contains some of the earlier work in Manitoba on sod seeding of alfalfa into existing forage stands

3.6 [Management of Canadian Prairie Rangeland Agriculture and Agri-Food Canada \(2008\)](#)

A comprehensive 74-page manual written by Art Bailey, Duane McCartney and Michael Schellenberg. Reviews the western prairie land resource, previous and current land use and the management systems that have been used and those that should be used to manage the Canadian prairie lands.

3.7 [Poisonous Plants \(2004\)](#)

Alberta Agriculture; review of some of the more poisonous species, plant descriptions and the management to avoid grazing hazards from these plants.

3.8 [Weed Control in Forage Crops \(2004\)](#)

Manitoba Agriculture Food and Rural Initiative; a review of management systems to control weeds in newly established and established forage crops by selective use of herbicides and mechanical means such as mowing at critical times.

3.9 [Rejuvenation of Tame Forages in Southern Saskatchewan \(1999\)](#)

Saskatchewan Agriculture & Food – a review of the techniques used to renovate existing forage stands.

3.10 [Weed and Brush Control \(2004\)](#)

Foragebeef.ca a general discussion of some of the major brush species that cause reduced productivity in pastures. Also has a listing of other Fact Sheets that will provide information to control brush.

4.0

Forage Management

(Each Sub-Title has a brief description of the Subject Article)

Click on the [Sub-Title](#) to view the article content

4.1 [*Benefits of Including Forages in Rotation*](#)

Manitoba Agriculture Food and Rural Initiative, Manitoba Forage Council, University of Manitoba (2007); includes a review of the benefits of using legumes in crop rotations. Some of these include; improved soil quality and fertility, reduced weed populations and increased yields of subsequent crops. There are some tips to consider when establishing a forage crop and also methods of moving from the forage crop back to an annual crop. Economic benefits are highlighted based on University of Manitoba research.

4.2 [*Protect Alfalfa from Winterkill*](#)

Manitoba Agriculture Food and Rural Initiative, Manitoba Forage Council; this FACT sheet reviews some of the management required to reduce the effect of winter injury. The use of winter hardy varieties for the climatic zones of Manitoba, effect of wheel traffic, the use of fertility and harvest timing to reduce losses. There is also a review of the critical fall harvest period to reduce damage and also how to assess winter injury in alfalfa stands.

4.3 [*“Getting Out” of Alfalfa*](#)

Manitoba Agriculture Food and Rural Initiative, University of Manitoba (2002); this FACT sheet discusses the use of tillage and the option of using herbicides to remove a forage crop. Comparative costs are provided for the different management systems.

4.4 [*Alfalfa Stand Assessment*](#)

Ontario Ministry of Agriculture and Food (2003); Through the use of pictures of damaged plants, stem and plant counts assist in the identification of injury.

4.5 [*Alfalfa Stand Assessment, is this stand good enough to keep?*](#)

Wisconsin Extension Service; this FACT sheet shows through photos, how to recognize damaged plants and with a scoring system that involves stand density and weed infestation as to when the stand should be terminated.

4.6 [*Calculate Risk of Alfalfa Winter Injury*](#)

Wisconsin Extension Service (2001); an easy to use chart that scores ; age of stand, winter hardiness ratings, disease resistance, moisture problems and cutting schedules used to rate the potential injury to an alfalfa stand.

5.0

Forage Fertility

(Each Sub-Title has a brief description of the Subject Article)

Click on the [Sub-Title](#) to view the article content

5.1

[Fertilizing Alfalfa Forage \(2002\)](#)

Manitoba Agriculture Food and Rural Initiatives; some general recommendations on forage fertility for use as hay or pasture such as; rates of application, timing of application for pure grass or legume stands and for grass/legume mixtures.

5.2

[Soil Fertility and Nutrient Recycling \(2008\)](#)

Agriculture and Agri-Food Canada, Brandon; This Fact Sheet reviews the experience at AAFC – Brandon over a six year period of using alfalfa in a grass based pasture system. The effect of fertility on nitrogen fixation by the alfalfa is discussed as is the effect of precipitation on the forage, and the livestock productivity. The results of nutrient recycling that occurred with the different grazing management systems is listed and there is a management summary.

5.3

[Forage Quality \(2008\)](#)

Agriculture and Agri-Food Canada, Brandon; This Fact Sheet reviews ten years of data from the pastures at AAFC at Brandon under different grazing and grass and grass/legume systems. Alfalfa content of pastures, dry matter intake of the forage and nutritional content of the forage is some of the data that was collected over the ten year period.

5.4

[The Importance of Including and Maintaining Alfalfa](#)

Agriculture and Agri-Food Canada, Brandon (2008);this Fact sheet provides the results of ten years of data from AAFC at Brandon and the forage and livestock production from grass only and grass/legume pastures both fertilized and non fertilized.

5.5

[Soil Fertility and Nutrient Recycling \(2008\)](#)

Agriculture and Agri-Food Canada, Brandon;this Fact sheet provides the results of ten years of data from AAFC at Brandon This study investigates the role of alfalfa and fertilizer on nutrient cycling in pastures.

5.6

[Forage Beef Nutrient Management \(2004\)](#)

Foragebeef.ca; this information sheet provides some of the general guidelines on how to manage a grazing system to maximize the nutrients produced in a sustainable manner.

5.7

[Native Range Fertilizer Guide \(2003\)](#)

Alberta Agriculture ; this provides some background of the potential use of additional fertilizer to native rangeland, the pros and the cons. It also reviews some of the major nutrients required.

5.8

[Fall Fertility for Forage Stands \(Frequently Asked Questions\) \(2004\)](#)

Alberta Agriculture; this information answers the questions as to why, when and how to apply fertilizer in the fall to forage stands.

5.9

[Fertility Management of Perennial Forage Stands \(2003\)](#)

Foragebeef.ca; contains some general information on fertilizing forages and a listing of many other FACT sheets on the topic.

5.10

[Fertility Management of Annual Stands \(2003\)](#)

Contains some general information on the fertility requirements of annual forage crops.

5.0

Forage Fertility (Continued)

(Each Sub-Title has a brief description of the Subject Article)

Click on the [Sub-Title](#) to view the article content

- 5.11 [*Nutrient Cycle in Pastures – \(Appropriate Technology Transfer for Rural Areas\) or ATTRA \(2002\)*](#)
An eleven page document that reviews in a comprehensive manner, the nutrient cycling that occurs in a pasture system.
- 5.12 [*Nutrient Uptake and Removal by Field Crops in Western Canada \(2001\)*](#)
Canada Fertilizer Institute
- 5.13 [*Nutrient Uptake and Removal by Field Crops in Eastern Canada \(2001\)*](#)
Canada Fertilizer Institute
- 5.14 [*Phosphorus and Potassium Fertility for Forages \(2000\)*](#)
Potash & Phosphate Institute of Canada (PPIC)
- 5.15 [*Manure on Alfalfa Hay \(2000\)*](#)
Missouri Extension; this pamphlet outlines some of the application strategies you should consider, rates of application versus the crop requirements, potential stand damage from excessive rates and possible weed infestations. The effects of excess rates of nitrogen in the manure to the forage are discussed as is the possible hay palatability issue.
- 5.16 [*Use of Hog Manure as a Fertility Source for Forages \(2002\) Trial results Manitoba Agriculture Food and Rural Initiative, University of Manitoba;*](#)
This report has the results of several trials conducted in SE Manitoba comparing methods of application of hog manure to forage and the response by different forage species to the hog manure. Also the use of hog manure as a fertility source in a grazing situation.
- 5.17 [*Nutrient Management on Intensively Managed Pastures \(2009\)*](#)
Alberta Agriculture ; This Fact Sheet contains information on; nutrient pools and pathways, nutrient uptake, sources and the effect of legumes on the nutrient balance, grazing management on nutrients, soil sampling, fertility options and environmental risks.
- 5.18 [*Keeping the Grass “Greener” on Your Side of the Fence*](#)
Understanding Pasture Fertility – a presentation to Manitoba Grazing School on the importance of good grazing management to maintain pasture fertility - Don Green, Forage Specialist Soils and Crops Branch, Manitoba Agriculture and Food, Carman, MB
- 5.19 [*Fertilizing and Managed Grazing as Tools to Optimize Pasture Production*](#)
A review of a trial conducted at several sites in Manitoba in 2000 to evaluate the effects of managed grazing and fertilizer application on pasture productivity - Don Green, Forage Specialist Soils and Crops Branch, Manitoba Agriculture and Food, Carman, MB

6.0

Forage Diseases & Insects

(Each Sub-Title has a brief description of the Subject Article)

Click on the [Sub-Title](#) to view the article content

6.1

[*Disease Management for Alfalfa \(2001\)*](#)

Manitoba Agriculture Food and Rural Initiative; this FACT sheet provides description by the use of photos of the major alfalfa diseases in Manitoba. Disease symptoms, prevention and control are outlined as are some of the management for a healthy crop.

6.2

[*Disease and Deficiencies in Forages*](#)

Manitoba Agriculture Food and Rural Initiatives; a review of the major diseases and nutritional deficiencies that can occur in Manitoba forage crops are discussed. Control methods are also outlined

6.3

[*Diseases and Nutrient Deficiencies in Alfalfa for Forage \(2004\)*](#)

Saskatchewan Agriculture; This Fact Sheet uses pictures, and a description of the symptoms plus control measures for some of the major diseases and nutritional deficiencies that can occur in the alfalfa plant as well as the control measures. Diseases and deficiencies reviewed include; crown rot, winter crown rot or snow mold, Verticillium wilt, Downey mildew and nutritional deficiencies in alfalfa. Scouting methods to assess the damage are also reviewed.

6.4

[*Forage Grasses Insect Management \(2004\)*](#)

Manitoba Agriculture Food and Rural Initiative; this Fact Sheet provides some of the control measures to control some of the insects in grasses.

6.5

[*Sweet Clover Insect Management Chart \(2004\)*](#)

Manitoba Agriculture Food and Rural Initiative; this FACT sheet provides some of the insecticides that may be used in control of insects in sweet clover.

6.6

[*Field Scouting Alfalfa- Lygus and alfalfa plant bug \(2004\)*](#)

Manitoba Agriculture Food and Rural Initiative; this FACT sheet provides some of the threshold levels of insect populations that will be of an economic threat to the crop. Several other insects are discussed as well as the insecticides and management used for control.

6.7

[*Grasshoppers Biology, Control, and Scouting \(2004\)*](#)

Manitoba Agriculture Food and Rural Initiative; this Fact Sheet reviews the factors that will influence the development of excess populations. How to; monitor, when to monitor and other control methods to reduce populations are discussed.

6.8

[*Grasshopper - Frequently Asked Question \(2004\)*](#)

Alberta Agriculture; methods of identification, control considerations, pasture management, and eco-bait systems are reviewed in this FACT sheet.

6.9

[*Grasshopper Management \(2003\)*](#)

Alberta Agriculture; This Fact Sheet uses pictures and detailed descriptions of the insects as well as the chemical and cultural measures required for control at economic thresholds

6.10 Northern Pocket Gopher – Biology and Management (2007) Manitoba Agriculture Food and Rural Initiative; this comprehensive FACT sheet provides an insight into this rodent; who they are, why they are a problem and the distribution in Manitoba. Control measures that have been used are reviewed such as trapping, rodenticides and crop management systems.

6.0 Forage Diseases & Insects (Continued)

(Each Sub-Title has a brief description of the Subject Article)

Click on the [Sub-Title](#) to view the article content

6.10 [*Northern Pocket Gopher – Biology and Management*](#)

Manitoba Agriculture Food and Rural Initiative (2007); this comprehensive FACT sheet provides an insight into this rodent; who they are, why they are a problem and the distribution in Manitoba. Control measures that have been used are reviewed such as trapping, rodenticides and crop management systems.

6.11 [*Insecticide Restrictions \(2004\)*](#)

Alberta Agriculture; this FACT sheet reviews some of the insecticides that can be used and the feeding restrictions required.

6.12 [*Evaluating Winter Injury to Alfalfa \(2005\)*](#)

University of Wisconsin; a review of the effect of ice on the survival of alfalfa.

7.1 **Harvesting Forage as Hay**

(Each Sub-Title has a brief description of the Subject Article)

Click on the [Sub-Title](#) to view the article content

7.1.1 [Haying Systems Review \(2008\)](#)

A seven page comprehensive review of haying systems, current and past research by Duane McCartney of Agriculture Agri-Food Canada Research Center, Lacombe, Alberta

7.1.2 [Value of Growing Quality Forage \(2004\)](#)

Manitoba Agriculture Food and Rural Initiative; a review of some of the forage harvesting practices used in Manitoba to harvest, store and feed high quality forage.

7.1.3 [Physiology of Hay Drying](#)

Dr Dan Undersander, Wisconsin Extension Service – presentation to Manitoba Forage Symposium (2003); this review discusses the physiological effects of the hay drying process and some options to reduce field losses to produce a higher quality product.

7.1.4 [How to Maintain Forage Quality during Harvest and Storage](#)

C. Allan Rotz –USDA; one of the top forage research/extension workers in the USA outlines some of the technology that can be used to harvest and store forage to preserve high quality. Also included is a review of some of the aids for preservation and the use of silage systems to maintain quality.

7.1.5 [Forage Symposium](#)

Manitoba Forage Symposium Proceedings 2003

7.1.6 [Forage Beef Storage Waste-Foragebeef.ca \(2004\)](#)

A brief review of the important factors to consider in the safe storage of harvested forage to reduce spoilage. A listing of other references is provided.

7.1.7 [Hay Management](#)

A brief review of the management practices for quality forage with an extended listing of other references.

7.1.8 [Big Bale Hay Storage \(1998\)](#)

Ontario Ministry of Agriculture and Food; a review of the storage options for storage of large round bales including outside and inside storage. The comparative losses of the various options and the costs of each system are listed.

7.1.9 [Using and Feeding Round Bales to Horses \(1998\)](#)

Ontario Ministry of Agriculture and Food (2004); a review of the practices required for best use of round bales for horses.

7.1.10 [Hay for Horses \(1999\)](#)

Ontario Ministry of Agriculture and Food; This Fact Sheet has pictures and description of the forage species that have potential for horses.

7.1.11 [How to Choose Hay to meet your Horse's Needs \(2009\)](#)

Manitoba Agriculture Food and Rural Initiatives; guidelines on nutrient requirements of horses, use of forage in the ration, guidelines for hay purchase, forage species suited for horses, general feed management for horses and answers to some general questions.

7.1.12 [Big Bale Hay Storage \(1996\)](#)

Ontario Ministry of Agriculture and Food; this Fact sheet outlines; why protect big bales, outdoor storage options, pole frame – partial and fully enclosed, economics of different systems.

7.1 **Harvesting Forage as Hay (Continued)**

(Each Sub-Title has a brief description of the Subject Article)

Click on the [Sub-Title](#) to view the article content

7.1.13 [Oklahoma Round Bale Strategy](#)

This Fact Sheet reviews some of the experiences in that State to store large round bales. It also includes outside stack storage, piling systems and tarps to cover, inside storage systems, building dimensions and storage capacities.

7.1.14 [Forage Harvesting Worksheet](#)

Manitoba Forage Council; An Excel spreadsheet that will help to assess the production and storage cost of a forage harvesting system. Hay Storage - Foragebeef.ca; a review of the important factors of hay storage systems with a listing of further references.

7.2 **Harvesting Forage as Silage**

(Each Sub-Title has a brief description of the Subject Article)
Click on the [Sub-Title](#) to view the article content

7.2.1 [Silage Management](#)

Some tips for producing and maintaining high quality forage as silage also a listing of additional resources.

7.2.2 [Silage Storage Techniques](#)

Saskatchewan Agriculture; this Fact Sheet reviews the principles of silage fermentation, the options for harvesting and storing forage as silage plus some of the feeding options.

7.2.3 [Crops for Silage Production](#)

Saskatchewan Agriculture; this Fact Sheet discusses many of the annual and perennial crops grown in western Canada that can be harvested as silage. Production tips as well as nutrient content of the silage crops are also listed.

7.2.4 [Soybeans for Silage \(2003\)](#)

Ontario Ministry of Agriculture and Food; this Fact Sheet reviews some of the consideration when harvesting immature soybeans or a crop that has been killed by frost and is to be harvested for feed as a silage crop.

7.2.5 [Silage Options \(2008\)](#)

Manitoba Forage Council; this Power Point presentation reviews some of the options for silage.

7.2.6 [Baled Silage Production \(2007\)](#)

Manitoba Agriculture, Food and Rural Initiative; this is a current review of the harvesting round bales as a silage system, the techniques to use and the potential feeding options.

7.2.7 [Baled Silage Production \(2001\)](#)

Manitoba Agriculture, Food and Rural Initiatives; this Fact Sheet provides some additional information on the options for storing baled silage.

7.2.8 [Harvesting and Storing Large Bale Haylage \(2001\)](#)

Ontario Ministry of Agriculture and Food; this Fact Sheet discusses the options of harvesting either round or square bales as silage (bailage). Stored as individual bales, multi-bale units or as a stack is reviewed as are some of the problems that could occur such as mold and the comparative economics and labour considerations of each system.

7.2.9 [Baled Haylage for Sheep \(1997\)](#)

Ontario Ministry of Agriculture and Food; this Fact sheet discusses the options of baled haylage for sheep and the extra cautions that are required for sheep due to the potential of mold which can cause major losses with sheep.

7.2.10 [Maintaining Quality in Large Bale silage \(1998\)](#)

Ontario Ministry of Agriculture and Food; this Fact Sheet reviews the silage making process, comparisons between chopped and large bale systems, moisture contents required, some of the handling and storage systems required and the plastic systems used to seal the silage. Storage locations and mold losses are also discussed.

7.2.11 [Factors affecting Bunker Silage Density \(2005\)](#)

University of Wisconsin; a review of some of the factors involved in the packing and the losses when filling a bunker silo.

7.3

Harvesting Quality Forage

(Each Sub-Title has a brief description of the Subject Article)

Click on the [Sub-Title](#) to view the article content

7.3.1 [High Quality Hay Management \(2007\)](#)

Manitoba Agriculture, Food and Rural Initiative; this Fact Sheet reviews many of the important management steps required to produce high quality forage.

7.3.2 [Manitoba Green Gold program \(2009\)](#)

Manitoba Agriculture, Food and Rural Initiative; this program has been used to estimate the ideal date for harvesting high quality forage in the south eastern portion of the province for the past 14 years. Clippings are taken from alfalfa fields and the Relative Feed Value determined from forage analysis. This Fact sheet summarizes much of this data.

7.3.3 [Manitoba Average Mineral levels in Forage \(2009\)](#)

Manitoba Agriculture, Food and Rural Initiative - From 2000 to 2005, mineral analysis from forage samples, hay and silage, were obtained from the Norwest/Bodycote Labs in Winnipeg. This Fact sheet summarizes the results.

7.3.4 [Feed Testing – An Important Management Tool \(2009\)](#)

Manitoba Agriculture, Food and Rural Initiative; this Fact Sheet stresses the importance of feed testing to balance rations and how to take an accurate sample

7.3.5 [Typical Manitoba Forage Analysis \(2009\)](#)

Manitoba Agriculture, Food and Rural Initiative; this Fact Sheet provides a brief summary of the average analysis of several Manitoba forages.

7.3.6 [Nitrates in Forage Crops \(2009\)](#)

Manitoba Agriculture, Food and Rural Initiatives; this Fact Sheet provides some of the background of why nitrates occur in forages, how to test for nitrates and to safely use them.

7.3.7 [Using Digestible NDF to Determine Forage quality](#)

Dr Dan Undersander, Forage specialist, University of Wisconsin – presentation to Manitoba Forage Conference 2003; this paper reviews the importance of Neutral Detergent Fiber portion of the plant in the determination of forage digestibility, its role in the determination of Total digestible Nutrient (TDN) of a feed test and also the new Relative Feed Quality (RFQ) for assessing forage quality.

7.3.8 [Predicting Alfalfa Quality Using PEAQ \(2003\)](#)

Ontario Ministry of Agriculture and Food; when determining the ideal time to cut alfalfa for maximum quality and yield, the neutral detergent fiber (NDF) portion of the plant appears to be one of the primary variables. Tests have shown that plant height measurements are closely related to the NDF in a feed test. This FACT sheet provides some of the data for the use of a PEAQ stick (Predicting Equations for Alfalfa Quality) to be able to determine in the field an estimate of when is the best time to cut.

7.3.9 [Harvest Maturity Affects Quality and Quantity of Cereal Silage \(1998\)](#)

Ontario Ministry of Agriculture and Food; This Fact sheet reviews how the stage of harvest and crop maturity will affect the nutritional value of the silage.

7.3.10 [High K Forages are still a problem for pre-calving Dry Cows \(2000\)](#)

Ontario Ministry of Agriculture and Food (2000); this Fact sheet reviews some of the milk fever problems caused by the use of forages high in K prior to calving. A summary of feed tested in Ontario provides some of the K ranges and there are some management suggestions as to how avoid the problem.

7.3 **Harvesting Quality Forage (Continued)**

(Each Sub-Title has a brief description of the Subject Article)

Click on the [Sub-Title](#) to view the article content

7.3.11 [Heat damage in silage and hay \(2004\)](#)

Alberta Agriculture; this Fact sheet reviews how heat damage occurs in forages, its effect on the nutrition of the animal, how to prevent heat damage and the use of feed testing to adjust rations from the effect of heat damage.

7.3.12 [Forage preservation \(2002\)](#)

Manitoba Agriculture, Food and Rural Initiative; this Fact sheet summarizes some of the products that have been used to preserve high moisture forages. There is a review of the major types and their preservation action.

7.3.13 [Mycotoxins in Silage; A Silent Loss in Profits](#)

Alan Gotlieb, University of Vermont; this report provides some of the history of mycotoxins and their seriousness in feed. It indicates why, where and under what conditions they occur and how certain practices worsen contamination. There are recommendations as how mycotoxins contamination may be reduced.

7.3.14 [Predicting Alfalfa Quality and cutting date by using PEAQ \(2000\)](#)

Ontario Ministry of Agriculture and Food; this Fact sheet reviews a system of measuring the plant height to determine the forage quality using the PEAQ system.

8.1 **Grazing Management Systems**

(Each Sub-Title has a brief description of the Subject Article)

Click on the [Sub-Title](#) to view the article content

8.1.1 [Pasture Management \(2001\)](#)

Manitoba Agriculture, Food and Rural Initiative; this fact sheet summarizes some of the grazing management practices used in Manitoba. It provides some of the animal performance data obtained from regional Grassland Society projects from the previous 15 years. Some of the topics included are: stocking rates, pasture options including native and seeded pastures, grazing systems including continuous grazing and rotational options. Animal health and nutrition in a grazing system are also discussed.

8.1.2 [Animal unit months, Stocking Rate and Carrying Capacity \(2002\)](#)

Manitoba Agriculture, Food and Rural Initiatives; this fact sheet provides information as to how to determine the carrying capacity of a pasture for a season, the stocking rate for a particular pasture for a period of time and the stock density which relates to the number of animals on an area of pasture for a period of time.

8.1.3 [Rotational grazing - ATTRA \(2004\)](#)

This comprehensive nine page bulletin covers many of the important management concepts required to develop your own Grazing System. Information is provided on; choosing a grazing system, fencing and water systems, forage growth and the management of growth and making seasonal adjustments for the grazing animals. There is also a section on informational resources and references.

8.1.4 [Pasture Planner - A Guide for Developing your Grazing System \(2007\)](#)

Manitoba Forage Council; this 44 page bulletin provides information on; grazing systems for Manitoba conditions including extended grazing , how to develop your own pasture plan, fencing and watering systems and animal control systems using well designed handling and management techniques

8.1.5 [Multi Species Grazing \(2001\)](#)

Manitoba Agriculture, Food and Rural Initiatives; this Fact sheet outlines some of the management considerations required when two or more animal species are used to graze and pasture within the same field or in sequence with each other.

8.1.6 [Grazing Management Planning Guide \(2004\)](#)

University of Minnesota; this extensive 46 page booklet provides extensive information on planning a grazing system. Some of the information is applicable only to the climate of Minnesota.

8.1.7 [Cow-calf Productivity and Forage Quality on Pasture \(2008\)](#)

Agriculture and Agri-Food Canada, Brandon; this Fact sheet outlines some of the research results at AAFC Brandon where the effect of alfalfa and/or fertilizer were determined on the forage quality and quantity of grass based (Meadow Brome grass) pasture and on cow/calf productivity.

8.1.8 [Pasture Carrying Capacity \(2008\)](#)

Agriculture and Agri-Food Canada, Brandon ; this Fact sheet outlines ten years of pasture data from AAFC Brandon with alfalfa grass and grass (Meadow Brome grass) only pastures under varying rates of fertility on the carrying capacity and the effect on residual forage.

8.1.9 [Forage Management Practices from the Best in Manitoba \(2008\)](#)

Manitoba Agriculture, Food and Rural Initiatives; this Fact sheet highlights some of the experiences of four of the top grazing and hay production managers in Manitoba.

8.1 Grazing Management Systems

(Each Sub-Title has a brief description of the Subject Article)

Click on the [Sub-Title](#) to view the article content

8.1.10 [Principles of Controlled Grazing \(1993\)](#)

David Pratt, Farm Advisor University of California Community Extension Service; this brief Fact sheet outlines the three phases of the pasture growth curve and how grazing management follows these growth curves to produce the optimum result.

8.1.11 [Deciding When to Move \(1993\)](#)

David Pratt, Farm Advisor, University of California Extension Service; This Fact Sheet outlines some of the decision making processes that need to be considered as to when you should be moving animals from one paddock to another.

8.1.12 [Grazing Tame Pastures Effectively \(1998\)](#)

Alberta Agriculture; this Fact Sheet provides some information on the effect of stocking rates on pasture and animal productivity, why animal size is important and the grazing system that need to be used. Grazing frequency, the importance of rest periods as well as methods of handling excess forage and forage shortages are also discussed.

8.1.13 [Estimating Pasture Forage Mass from Pasture Height \(2003\)](#)

West Virginia University ; this Fact sheet details how an estimation of pasture dry matter can be estimated by measuring the height of the forage at various locations in the pasture.

8.1.14 [A “Falling Plate” Meter for Estimating Pasture Forage Mass \(2003\)](#)

West Virginia University ; this Fact sheet describes how you can build a very simple device to accurately measure the dry matter of a pasture.

8.1.15 [Estimating available pasture forage \(1998\)](#)

Iowa State University; a detailed analysis of the use of field measurements to determine pasture forage available to the grazing animal.

8.1.16 [Determining pasture condition \(1996\)](#)

Wisconsin Extension; this Fact sheet reviews a scoring system to rate the condition of a pasture. Examples are given as to how it could be after a heavy grazing compared to a moderate grazing. Another makes the comparison before and after some frost seeding.

8.1.17 [Alberta Tame Pasture Scorecard \(2004\)](#)

Alberta Agriculture; this Fact Sheet details the Alberta system of assessing a pasture. It discusses a score card system, how to use one, making notes of the forage species and using it to improve pasture productivity.

8.1.18 [What Do We Do Now with a Grazed Pasture?](#)

Alberta Agriculture; this article discusses some of the options to manage a grazed pasture and describes some of the productivity of annual and perennial pastures in Alberta.

8.1.19 [Management Intensive Grazing \(2000\)](#)

Manitoba Agriculture; this 34 page bulletin discusses the details of the concept of Management Intensive Grazing (MIG) systems. Details are provided on understanding how plants grow and are affected by grazing, improving pasture productivity, and understanding of how animals graze and how to pull all the management aspects together to develop an effective grazing system.

8.1 **Grazing Management Systems (Continued)**

(Each Sub-Title has a brief description of the Subject Article)
Click on the [Sub-Title](#) to view the article content

8.1.20 [Grass Growth and Response to Grazing](#)

Colorado State University; this Fact sheet describes how the grass plant react to grazing.

8.1.21 [Sheep Grazing Management \(2008\)](#)

Saskatchewan Agriculture - a review of some of the grazing management practices used for sheep including predator control.

8.2

Range Management

(Each Sub-Title has a brief description of the Subject Article)

Click on the [Sub-Title](#) to view the article content

8.2.1 [Managing Saskatchewan's Rangelands \(2004\)](#)

Saskatchewan Agriculture; this Fact sheet reviews some of the management concepts for rangelands including the understanding necessary of the biology of the range plant and the grazing animal.

8.2.2 [Management of Canadian Rangeland \(2009\)](#)

Bailey & McCartney; a 74 page intensive review of the Western Canada prairies, the resources, landscape and the sustainable management required.

8.2.3 [Common Grazing Mistakes Made by Rangeland Owners and Managers \(1999\)](#)

Texas Agricultural Extension Service; we can always learn from our mistakes and this article illustrates some of the more common ones.

8.2.4 [Rangeland Management during Drought \(2004\)](#)

Agriculture and Agri-Food Canada; this Fact Sheet discusses the effects of a drought on the rangeland and also on the grazing livestock. It suggests some management practices to reduce the effect of a drought and also the management that should occur after the drought is over.

8.2.5 [Drought on Pastures and Rangelands \(2004\)](#)

This Fact Sheet provides some of the management highlights for managing during a drought and a listing of other references.

8.2.6 [Grazing Management of Rangeland in the mid West](#)

Kansas Extension

8.2.7 [Grasses for the Northern Plains](#)

North Dakota State Extension; this publication summarizes plant characteristics of cool season forage species suited to the Northern Plains.

8.2.8 [When to Graze Native Pastures](#)

North Dakota State Extension; this Fact Sheet reviews the plant development of native grasses, development stages, how to calculate growing degree days and determining when to graze.

8.2.9 [Early Grazing Strategies for Range Pastures](#)

North Dakota State Extension; this publication discusses the possible strategies to use for grazing in late April and early May. This includes the positive and negative consequences and techniques to minimize damage.

8.3

Pasture Quality

(Each Sub-Title has a brief description of the Subject Article)

Click on the [Sub-Title](#) to view the article content

8.3.1 [Pasture Quality Survey-Manitoba Eastern/Interlake area \(1999\)](#)

Manitoba Agriculture, Food and Rural Initiatives; this report is a survey conducted at 22 sites from 1996 to 1998 at Selkirk, Beausejour, Dugald, Steinbach, Teulon and Lundar. At each site, grazing cages were erected to protect the sites from the grazing animals and clippings were taken twice during the grazing season and a complete nutrient analysis and dry matter yield analysis obtained. The forage species varied with each site and were either; native pasture, seeded grass/legume or seeded grass pastures. There was also a comparison where hog manure was applied to a seeded pasture.

8.4 Alfalfa Grazing and Pasture Bloat

(Each Sub-Title has a brief description of the Subject Article)

Click on the [Sub-Title](#) to view the article content

8.4.1 [Prevention of Pasture Bloat in Cattle Grazing Alfalfa \(2007\)](#)

Manitoba Agriculture, Food and Rural Initiative ; this Fact sheet reviews some of the conditions that cause bloat in pasture and some of the management that can be used for prevention.

8.4.2 [Legume Grazing \(2004\)](#)

This Fact Sheet provides some of the management highlights for managing bloat on pasture and also provides some references for additional information.

8.4.3 [Bloat on Legume Pastures \(1998\)](#)

University of Delaware Extension; some detailed methods of bloat treatment and management.

8.4.4 [Principles and Practices for Successful Grazing of Alfalfa \(2004\)](#)

Dr Jim Gerrish, University of Missouri Forage Systems Research Center; this Fact Sheet covers many of the successful practices for grazing alfalfa both for stand persistence and animal performance.

8.4.5 [Steps Towards Bloat-Safe Grazing of Alfalfa; Keys to Maximizing Gains of Back-grounding Cattle and Cow-Calf Pairs on Pasture \(1999\)](#)

This Fact Sheet is a comprehensive summary of the factors causing pasture bloat based on much of the research conducted in Western Canada. There is some information on bloat prevention remedies that have been used.

8.4.6 [Feeding Legumes to Cattle \(2003\)](#)

This Fact Sheet contains a summary of some of the common legumes used in Western Canadian pastures and their bloat potential. There is also a listing of ten steps for prevention.

8.5

Horse Pasture Management

(Each Sub-Title has a brief description of the Subject Article)

Click on the [Sub-Title](#) to view the article content

8.5.1 [*The Basics of Horse Pasture Management \(1998\)*](#)

British Columbia Agriculture; some guidelines for management of horse pastures

8.5.2 [*Horse Pasture Management \(1993\)*](#)

North Dakota State Extension ; this publication provides information on pasture use, type, establishment, renovation, maintaining and use of exercise pastures.

8.5.3 [*Managing Horse Pastures \(1998\)*](#)

Ontario Ministry of Agriculture and Food ; this Fact Sheet provides some guidelines for the grazing management of horse pastures and some suggestions for rejuvenation including possible forage mixtures.

8.5.4 [*Weed Control in Horse Pastures \(1998\)*](#)

Ontario Ministry of Agriculture and Food; this Fact Sheet provides some guidelines why weeds become a problem, some options for control and the concern for some poisonous weeds that can occur.

8.5.5 [*Pasture Management for Small Holdings \(2000\)*](#)

Alberta Agriculture ; this Fact Sheet provides some management tips for those who have smaller farm units where horses are likely the major grazing animal. Tips are provided on the care and management of the pastures.

9.0

Extended Grazing Systems

(Each Sub-Title has a brief description of the Subject Article)

Click on the [Sub-Title](#) to view the article content

9.1 [Quick Guide to Extended Grazing \(2007\)](#)

Manitoba Agriculture, Food and Rural Initiatives; this provides an overview of some of the options for extending the grazing season; stockpiled forage systems, use of annuals for spring & fall grazing, crop residues, bale & swath grazing systems, use of snow as a water source and the shelter and bedding requirements.

9.2 [Winter Grazing Options \(2007\)](#)

Manitoba Agriculture, Food and Rural Initiatives; This Fact Sheet discusses many of the options for extending the grazing season for beef cattle in Manitoba. The nutrients analysis and costs of several Manitoba graziers are included.

9.3 [Basics and Benefits of Bale Grazing \(2007\)](#)

Manitoba Agriculture, Food and Rural Initiatives; this Fact Sheet outlines the benefits, economics and detailed management of a Bale Grazing system in Manitoba

9.4 [Snow as a Water Source for Wintering Cattle \(2007\)](#)

Manitoba Agriculture, Food and Rural Initiatives; cattle on extended grazing systems can use snow as their source of water. This Fact sheet covers some of this experience in Western Canada.

9.5 [Livestock Wintering - Locating and Managing your Site to make it more Sustainable \(2007\)](#)

Manitoba Agriculture, Food and Rural Initiatives; this Fact Sheet discusses site selection that takes into consideration environmental and nutrient management strategies

9.6 [Livestock Wintering - How Can it Work for You \(2007\)](#)

Manitoba Agriculture, Food and Rural Initiatives; this Fact Sheet discusses the four strategies for livestock wintering; resource management, feeding management, farm site management, and infrastructure management such as water and fencing.

9.7 [Grazing Cattle on Corn \(2007\)](#)

Manitoba Agriculture, Food and Rural Initiatives; this Fact Sheet outlines the management and economics of a corn grazing system in Manitoba.

9.8 [Winter Swath Grazing \(2009\)](#)

Saskatchewan Agriculture; this Fact Sheet, reviews the options for swath grazing annual forages based producer experience in Saskatchewan.

9.9 [Stockpiling Perennial Forages for Fall & Winter Grazing \(2002\)](#)

Ontario Ministry of Agriculture and Food ; this Fact sheet discusses; stockpiling management, forage species, soil fertility, time of grazing, animal performance, grazing management, watering and winter survival of the pasture.

9.10 [Extended Grazing – The Sustainable Future \(2004\)](#)

Alberta Agriculture ; this article provides a cost comparison between traditional winter feeding systems and swath and bale grazing systems.

9.0 Extended Grazing Systems (Continued)

(Each Sub-Title has a brief description of the Subject Article)

Click on the [Sub-Title](#) to view the article content

9.11 [Plan your Stockpiling Program Now \(2002\)](#)

This article reviews some of the concepts of stockpiling, the forage species most adaptable and the management of the system.

9.12 [Portable Windbreak Fences \(2002\)](#)

This reviews many of the different types of portable wind fences that have been used successfully on Western Canadian farms. There are detailed sketches as how to build some of these units.

9.13 [Bale Grazing Calculator for Home Grown and Purchased Hay \(2008\)](#)

This calculator allows you to determine the efficiencies in bale grazing compared to the more traditional methods of winter feeding hay.

10.0

Livestock Grazing Facilities

(Each Sub-Title has a brief description of the Subject Article)

Click on the [Sub-Title](#) to view the article content

10.1 [Paddock Design-Foragebeef.ca \(2003\)](#)

A summary of some of the important aspects to consider when considering a pasture design. Additional references are also supplied.

10.2 [Farm Fencing systems \(2002\)](#)

Ontario Ministry of Agriculture and Food ; this Fact Sheet, reviews the different types of fencing materials from wire to wood, brace assemblies and reviews some comparative prices (year 2000).

10.3 [Getting Started Grazing-Design](#)

Ohio State University; a step by step process of paddock layouts and design.

10.4 [Number and Size of Paddocks \(1992\)](#)

West Virginia University Extension Service; this Fact Sheet answers the question as to – how many paddocks do I need?

10.5 [Braces, Wire, Staples](#)

A review of the major segments of a fencing system with comparisons to the many options. There is also a listing of additional references.

10.6 [Brace Assemblies for Wire Fences – What are They – How they Work – How to Construct them \(1996\)](#)

British Columbia Ministry of Agriculture ; this Fact Sheet reviews – what is a brace, the forces affecting it, problems with faulty braces, comparison of different types, materials to use and recommended construction practices.

10.7 [Electric Fence Systems.](#)

Some of the major highlights of an electric fencing system. Additional references indicated.

10.8 [Training, Testing and Trouble Shooting \(1996\)](#)

Living with an electric fence-British Columbia Ministry of Agriculture; this Fact Sheet includes information on; training of the livestock, testing the grounding system, effective voltage and general trouble shooting.

10.9 [Fencing Systems for Grazing Management.](#)

Missouri Extension; Jim Gerrish outlines some of the principles involved in electric fencing systems

10.10 [Trouble Shooting Problems with Electric Fencing](#)

California Extension; Dave Pratt outlines the process to identify problems with an electric fencing system.

10.11 [Fences that Work –Temporary Electric Fence Materials](#)

Dave Pratt of California Extension - outlines some of the characteristics of temporary fencing materials.

10.12 [Winter Electric Fencing Tips](#)

Jim Stone, who teaches fencing and other topics at Olds College in Alberta, has some tips to make your electric fences as effective in winter as they are in summertime.

10.0 **Livestock Grazing Facilities (Continued)**

(Each Sub-Title has a brief description of the Subject Article)

Click on the [Sub-Title](#) to view the article content

- 10.13 [*Behaviour Principles of Handling Livestock*](#)
Temple Grandin reviews the basic principles needed to develop an effective handling system.
- 10.14 [*Beef Cattle Handling Facilities*](#)
Saskatchewan Agriculture; details some of the dimensions required in a handling facility.
- 10.15 [*Simple pasture handling facilities \(2004\)*](#)
Manitoba Agriculture, Food and Rural Initiative; several basic designs for pasture facilities which involve the use of some of the animal behaviour concepts.
- 10.16 [*Pasture Water Systems*](#)
Foragebeef.ca; general review of watering systems with additional references
- 10.17 [*Livestock Water Quality*](#)
Saskatchewan Agriculture; describes acceptable standards for interpreting water tests.
- 10.18 [*Evaluating pasture water quality \(2004\)*](#) Manitoba Agriculture, Food and Rural Initiative; a review of the water quality requirements for grazing animals.
- 10.18 [*Evaluating Pasture Water Quality \(2004\)*](#)
Manitoba Agriculture, Food and Rural Initiative; a review of the water quality requirements for grazing animals. Evaluating pasture water quality- Manitoba Agriculture, Food and Rural Initiative (2004); a review of the water quality requirements for grazing animals.
- 10.19 [*Pasture Water Systems for Livestock \(2002\)*](#)
Alberta Agriculture; this Fact Sheet discusses; water problems on pasture including trials which show losses also alternative systems such as; dugouts, access ramps in streams, hauling water to pasture, water storage systems, animal operated pumps, pasture pipeline systems, gas and solar powered pumps, use of ground water resources and wintering systems.
- 10.20 [*Remote Winter Watering Systems for Beef Cattle \(2007\)*](#)
Manitoba Agriculture, Food and Rural Initiatives; this Fact Sheet provides information on the use of winter watering systems of particular use for extended grazing systems. Four options are illustrated; Monitor Detection Pump-up system, Portable Ice Free Waterers, Mining Tire Geothermal Waterer, Geothermal Ice Free waterer.
- 10.21 [*Troughs for Watering Range Livestock \(2004\)*](#)
Agriculture and Agri-Food Canada; this Fact Sheet provides information on the water flow required for livestock on pasture, sizing and also location of the trough plus several trough options.
- 10.22 [*Pasture Tanks and Troughs*](#)
Foragebeef.ca; this article reviews some of the essentials for effective construction and use of water troughs. A number of useful references are also provided.
- 10.23 [*Pasture Pipeline Systems*](#)
Foragebeef.ca; pasture pipelines are an effective method of providing water to pastures and a way of more evenly distributing the grazing animal and nutrient distribution. This information reviews some of the essentials and provides some additional references.

10.0

Livestock Grazing Facilities (Continued)

(Each Sub-Title has a brief description of the Subject Article)

Click on the [Sub-Title](#) to view the article content

10.24

[*Riparian Stewardship Fence Calculator*](#)

Excel spreadsheet to calculate fencing costs.

10.25

[*Pasture Facilities Worksheet \(2007\)*](#)

Manitoba Forage Council; this Excel Spread worksheet may be used to determine the costs for the fencing and facilities for a grazing system.

11.0

Grass Fed Beef Systems

(Each Sub-Title has a brief description of the Subject Article)

Click on the [Sub-Title](#) to view the article content

11.1 [Forage Finished Beef \(2007\)](#)

Manitoba Forage Council; this 28 page bulletin discusses the concepts of raising and finishing beef on high forage or forage only diets. Includes the use of high quality pasture for growing and finishing, the use of high quality forage for the wintering period and some of the animal genetics and the meat processing factors to be considered.

11.2 [Forage Finished beef Fact Sheet \(2007\)](#)

Manitoba Forage Council ; a four page Fact Sheet that outlines some of the basics of raising and finishing beef on high quality forage diets.

11.3 [Value Chain for Beef for the Health Food Marketing \(2007\)](#)

Manitoba Forage Council; this Fact Sheet reports on the results of a feeding trail at AAFC Brandon in 2003-05 following a pasture period, finishing beef animals were fed rations with sunflowers to maintain the CLA levels in the meat compared to the traditional barley finishing rations.

11.4 [Meeting the Challenges of Pasture Finished Beef \(2003\)](#)

West Virginia University ; this Fact Sheet provides some of the major aspects of a pasture finishing beef program. eatwild.com; This well referenced article which is part of the “Eat Wild” web site, provides some comparisons of grass-fed beef to other meats in regards to some of the nutrient content of the meat.

11.5 [Health benefits of Grass-fed-Eat Wild.com](#)

This well referenced article which is part of the “Eat Wild” web site, provides some comparisons of Grass-fed beef to other meats in regards to some of the nutrient content of the meat.

11.6 [Grass fed Basics](#)

This is another article from this web site which provides an overview of the basics of grass-fed meats.

11.7 [Manitoba Forage Finished Beef Potential in Niche Markets \(2006\)](#)

Manitoba Forage Council – a 125 page document that researches and evaluates the potential for forage finished beef in Manitoba. Report conducted by Kelwin and Associates and the Manitoba Forage Council. Funded by Manitoba Rural Adaptation Council and Covering New Ground.

11.8 [Argentina Grass fed systems - 2009 tour of Manitoba producers](#)

Manitoba Forage Council; a 34 page report of what they saw, discussed and learned on a tour to Argentina to see first hand how the Argentinean farmers produce some of the best “grass fed Beef ” in the world.

11.9 [Producing Forage Finished Beef](#)

Presentation at the 2006 Manitoba Grazing School by Dr Anibal Pordomingo of Argentina; this 34 page paper outlines much of the technology used in Argentina to grow and finish beef on a forage only diet.

11.10 [Grass-fed Beef Model \(2009\)](#)

Manitoba Forage Council; this Excel Spreadsheet provides an opportunity to determine the profitability of a grass-fed beef system from your land base.

12.0

Livestock Management

(Each Sub-Title has a brief description of the Subject Article)

Click on the [Sub-Title](#) to view the article content

12.1 [Alternative Feed Manual \(2007\)](#)

Manitoba Agriculture, Food and Rural Initiatives; this comprehensive manual consists of five Fact Sheets, reviews alternative feeds for cattle and sheep, the processing options, nutritional problems and chemical residue dangers with some feed by-products.

12.2 [Chaff; Ammoniation, Nutrition and Feeding \(1998\)](#)

Saskatchewan Agriculture; this Fact Sheet outlines the technology required for increasing the nutrient quality of chaff residue by the use of anhydrous ammonia. It includes information on the use of chaff, collection systems, the ammoniation process and the feeding and nutrition of the product.

12.3 [Back grounding Calves with Manitoba Forage \(2007\)](#)

Manitoba Agriculture, Food and Rural Initiative ; this Fact Sheet provides some of the factors to consider when using high quality forage in the backgrounding ration. The results of local trials are also included.

12.4 [Minerals for Beef Cattle \(2009\)](#)

Saskatchewan Agriculture; this Fact Sheet provides some of the considerations when selecting a self fed mineral for beef animals depending on the type of ration (forage) being fed.

12.5 [Feeding Quality of Stockpiled Forage \(2007\)](#)

Manitoba Agriculture, Food and Rural Initiative ; this Fact Sheet provides some results of stockpiled forages in Manitoba including feed quality and quantity.

12.6 [Green feed in Wintering Rations \(2003\)](#)

Foragebeef.ca; highlights of the use of green feed in wintering rations are discussed and additional references for more information are provided.

12.7 [Low-stress livestock systems \(2007\)](#)

Manitoba Agriculture, Food and Rural Initiatives; this Fact sheet provides some of the technology that is used for effective and safe handling of cattle.

12.8 [Increasing Cow/calf Profitability using a Chaff and Chaff/straw Feedstuffs \(2004\)](#)

Manitoba Agriculture, Food and Rural Initiatives ; this Fact Sheet reviews some of the methods used to collect crop residues, the feed value to the cow/calf unit and the comparative profitability.

12.9 [Ammoniating of Forages \(2002\)](#)

Manitoba Agriculture, Food and Rural Initiatives ; this Fact Sheet provides information on the effect of the ammoniation process on the nutrient levels of feed, the steps involved to ammoniate forage, how to build and seal the stack and to apply the anhydrous ammonia. An example is provided on how to calculate the amount of anhydrous to add and the feeding precautions for the animals.

12.10 [Straw is an Alternative Roughage Source for Wintering Beef Cows \(2004\)](#)

Manitoba Agriculture, Food and Rural Initiatives ;this Fact Sheet provides some information on the nutrient requirements of the wintering beef cow, the nutrient content of some crop residues and some sample rations that would meet the requirements.

12.0

Livestock Management (Continued)

(Each Sub-Title has a brief description of the Subject Article)

Click on the [Sub-Title](#) to view the article content

- 12.11 [*Endophyte Toxicity*](#)
Some grass seed straws do contain this toxin and this Fact Sheet provides some of the background of the problem and what you can do to safely use some of these feeds.
- 12.12 [*Tetany*](#)
The reasons for Tetany and how to manage it are discussed.
- 12.13 [*Moulds and Mycotoxins*](#)
Some of the major factors regarding mouldy feeds are discussed in this summary.
- 12.14 [*Prussic Acid Toxicity*](#)
What is Prussic acid poisoning, where it is found and what can be done about it are reviewed in this section.
- 12.15 [*Toxins and Poisons*](#)
Several of the major toxins and poisons that can be found in feeds are discussed in this article.
- 12.16 [*Bison – Basic Nutrition*](#)
Saskatchewan Agriculture; this includes a 20 page brochure on the feeding considerations for bison.
- 12.17 [*Feeding in Dry Conditions – Adapting to Alternative Feeds*](#)
Saskatchewan Agriculture; this Fact Sheet outlines some of the feed values and feeding options from alternative feeds. It also provides some warnings to some feeds that might be considered in dry years.
- 12.18 [*Feeding Kochia \(2004\)*](#)
Saskatchewan Agriculture ; this Fact Sheet provides some guidelines for feeding Kochia, a weed usually found in dry years or on saline soils.

13.0

Environmental Considerations

(Each Sub-Title has a brief description of the Subject Article)

Click on the [Sub-Title](#) to view the article content

13.1 [Energy use efficiency of pastures \(2008\)](#)

Agriculture and Agri-Food Canada, Brandon; this Fact Sheet provides the results from a ten year grazing study at Brandon where the energy efficiency of grass and grass/legume pastures were determined. This included comparisons of the energy inputs to the output for the various systems.

13.2 [Methane Production on pasture systems \(2008\)](#)

Agriculture and Agri-Food Canada, Brandon; this Fact sheet provides results form tests at Brandon in 1995 where the methane production from cattle were determined when grazing on grass and grass/legume pastures.

13.3 [Carbon Sequestration in Pastures \(2008\)](#)

Agriculture and Agri-Food Canada, Brandon; this Fact Sheet provides information on an eight year study to determine the amount of carbon sequestration from grass and grass/legume pastures.

13.4 [Greenhouse Gas Management on Pasture \(2003\)](#)

Agriculture and Agri-Food Canada & Canadian Cattlemen's Association; this Fact Sheet provides a review of the grazing management practices that can be used to reduce Green House gases.

13.5 [Good Management Practises to reduce Green House Gas \(2003\)](#)

Agriculture and Agri-Food Canada & Canadian Cattlemen's Association; this provides a review of the Green House Gas emissions from agricultural practices.

13.6 [Feeding Strategies to reduce Greenhouse Gas \(2003\)](#)

Agriculture and Agri-Food Canada & Canadian Cattlemen's Association; this bulletin provides information on feeding strategies and by breeding more feed efficient animals can lower the emissions of Green House gases.

13.7 [Greenhouse Gas Manure Management \(2003\)](#)

Agriculture and Agri-Food Canada & Canadian Cattlemen's Association (the breakdown of manure releases many green house gases). More effective manure management can reduce gas emissions.

14.0

Riparian Health

(Each Sub-Title has a brief description of the Subject Article)

Click on the [Sub-Title](#) to view the article content

14.1 [Riparian Grazing Strategies](#)

Managing the Waters Edge; this is a copy of four Fact Sheets prepared for producers who have water courses in their grazing systems. This provides you with some excellent information as to how care for the water ways in a sustainable manner.

14.2 [Managing Riparian Areas – Experiences from Five Manitoba Farms](#)

Managing the Waters Edge; some comments on the management systems used by these experienced graziers on how they manage the forages along their water course.

14.3 [Riparian Areas and their Importance – Saskatchewan Agriculture](#)

Fact Sheet that outlines some of the management systems used in Saskatchewan.

14.4 [Riparian Health](#)

Power Point presentation.

15.0

Economics & Marketing

(Each Sub-Title has a brief description of the Subject Article)

Click on the [Sub-Title](#) to view the article content

- 15.1 [*Manitoba Forage & Grassland Industry Strategic Plan*](#)
This strategic plan identifies the Manitoba Forage & Grassland industry's issues, emerging opportunities and developments that need to be undertaken so that the Manitoba Forage Industry may fully capitalize upon opportunities. The Strategic Plan has developed a prioritized action plan, including potential new industry partnerships and strategic alliances and public sector support needed, to achieve the identified objectives and strategies.
- 15.2 [*The Basics of Marketing Cash Hay \(2007\)*](#)
Manitoba Agriculture, Food and Rural Initiatives ; this Fact Sheet provides information on the opportunities for marketing hay, the package sizes that have the best market opportunity, the importance of feed testing, marketing location tips, shipping regulations and cautions for selling in the market.
- 15.3 [*Transporting hay to USA Markets \(2001\)*](#)
Manitoba Agriculture, Food and Rural Initiatives; this publication provides some of the licensing and transportation requirements when shipping across the USA border. Requirements vary from state to state so it is wise to phone ahead and find out the requirements before starting down the road.
- 15.4 [*Pasture Cost of Production \(2007\)*](#)
Manitoba Agriculture, Food and Rural Initiatives; this worksheet is based on 2007 cost of production but can be adapted to your situation.
- 15.5 [*Alfalfa hay costs \(2008\)*](#)
Manitoba Agriculture, Food and Rural Initiatives; this worksheet is based on 2008 cost of production and can be adjusted to your farm. 14.6 Barley and Corn silage Costs (2008) Manitoba Agriculture, Food and Rural Initiatives; this worksheet provides an outline of the economics of silage in Manitoba.
- 15.6 [*Barley and Corn silage Costs*](#)
Manitoba Agriculture, Food and Rural Initiative (2008) – this worksheet provides an outline of the economics of silage in Manitoba.
- 15.7 [*Beef Cow Calf Production Costs based on 150 Cow Herd \(2008\)*](#)
Manitoba Agriculture, Food and Rural Initiatives; this guide provides some of the costs to consider in developing your own cost of production for a 150 cow herd.
- 15.8 [*Estimating Beef Grassing Costs for 500 head \(steers\) \(2007\)*](#)
Manitoba Agriculture, Food and Rural Initiatives; this guide will provide some of the cost involved in a grassing program and can be adjusted to your own farm situation.
- 15.9 [*Beef background costs 2009 \(2009\)*](#)
Manitoba Agriculture, Food and Rural Initiatives; this worksheet reviews the financial inputs for backgrounding weaned calves in Manitoba.
- 15.10 [*Cow calf Share Lease \(2007\)*](#)
Manitoba Agriculture, Food and Rural Initiatives; this outlines some of the consideration you need to know when developing a cow lease arrangement.
- 15.11 [*Custom pasture agreement \(2002\)*](#)
Manitoba Agriculture, Food and Rural Initiatives; some guidelines for developing a custom pasture arrangement.

15.0 **Economics & Marketing (Continued)**

(Each Sub-Title has a brief description of the Subject Article)

Click on the [Sub-Title](#) to view the article content

15.12 [Timothy hay production costs \(2002\)](#)

Manitoba Agriculture, Food and Rural Initiatives; cost of production outlines that you can use to develop your own cost of production.

15.13 [Pricing Corn Silage \(2002\)](#)

Ontario Ministry of Agriculture & Food; this Fact Sheet provides the type of information to consider when determining the price of corn silage.

15.14 [Economics of Grass-Legume Pastures \(2008\)](#)

Agriculture and Agri-Food Canada, Brandon; based on ten years of data from the AAFC at Brandon, this Fact Sheet reviews the profitability of grass only and grass/legume pastures – fertilized and unfertilized of the ten year period.

15.15 [Grass-fed Beef Model](#)

Manitoba Forage Council; this spreadsheet may be used to develop a financial plan of a forage/beef system from the forage establishment phase to harvesting the beef directly to market as a finished product. You can adjust the model to fit your own requirements.

15.16 [Hay Marketing Brochure \(2009\)](#)

Manitoba Agriculture, Food and Rural Initiatives; this brochure promotes Manitoba Hay products and has the current listing of Manitoba hay marketers.

15.17 [Horse Hay Brochure \(2007\)](#)

Manitoba Agriculture, Food and Rural Initiatives; this promotional brochure outlines the type of horse hay products available in Manitoba and some of the hay marketing contacts for hay.

15.18 [Hay Sell or Feed \(2007\)](#)

Manitoba Agriculture, Food and Rural Initiatives; this work sheet provides an opportunity to look at the options of either selling your hay or feeding to your own livestock. It also provides an indication of whether you should grow your own hay or purchase it.

15.19 [Dairy Genetics Directory \(2004\)](#)

Manitoba Agriculture, Food and Rural Initiatives; this provides a partial listing of dairy farms that have dairy genetics for sale as of 2004.

15.20 [Canadian Cattle Statistics](#)

Statistics Canada (2009).

15.21 [Canadian Sheep Statistics](#)

Statistics Canada(2009).

15.22 [Manitoba Cattle Prices](#)

Manitoba Agriculture, Food and Rural Initiative (2009).

16.0 Forage & Grassland References (websites)

Manitoba Agriculture – MAFRI	(http://www.gov.mb.ca/agriculture/index.html)
Manitoba Forage Council	(http://mbforagecouncil.mb.ca/default.aspx)
University of Manitoba – La Broquerie grazing project	(http://www.umanitoba.ca/afs/labroquerie/)
Saskatchewan Agriculture	(http://www.agriculture.gov.sk.ca)
Saskatchewan Forage Council	(http://www.saskforage.ca)
Western Beef Development Centre – Sask	(http://www.wbdc.sk.ca)
Alberta Agriculture	(Alberta Agriculture Crop Information Page)
AB Foothills Co-op	(Foothills Forage & Grazing Association)
Forage Beef – information centre	(Forage Beef Information)
Ontario Agriculture OMAF	(OMAF Web Page "Forages and Pastures")
Ontario Forage Council	(http://www.ontarioforagecouncil.com/)
North Dakota State Extension	(http://www.ag.ndsu.edu/pubs/forages.html)
Minnesota State Extension	(http://www.extension.umn.edu/forages/)
Wisconsin forage Council	(http://www.uwex.edu/ces/forage/wfc.htm)
Hay & Forage Associations	(http://forages.oregonstate.edu/index.cfm)
Agriculture & Agri-Food Canada	(http://www.agr.gc.ca/index_e.php)