



Preventing Hay Fires: Moisture & Storage

Hay fires that damage or destroy hay, buildings, and livestock cost farmers millions of dollars in building and feed replacement costs, lost revenue, and increased insurance rates. Since 2000, there have been over 900 livestock and poultry barn fires in Minnesota, resulting in over 26 million dollars in damages (Minnesota Fire Incident Reporting System). Although not specifically tracked by MFIRS, some of these fires have been caused by spontaneous combustion of hay that was baled too wet.

Proper moisture at baling is the key to preventing hay fires. Managing the curing process and storage is vital to reducing the risk of hay fires.

MOISTURE IS THE KEY. Moisture content of the hay at time of baling is the single biggest hay fire risk factor. Hay baled at less than 15% moisture has a minimal risk of fire. As moisture content increases, the risk of dry matter losses and fire increase.

THE CURING PROCESS AND BALE TEMPERATURE. Baled hay becomes a potential fire hazard when the interior bale temperature does not decrease. This occurs when heat is created by microorganism respiration. Table 1 lists the effects of internal bale temperature and fire potential.

Maximum temperature is not the only concern with potential hay fire. Rate of temperature rise should also be monitored and considered when addressing a fire risk. If the internal bale temperature is gradually rising, there is usually a minimal risk of fire. However, if a rapid rise in temperature occurs, the risk of fire is high.

MINIMIZING THE RISK OF HAY FIRES. Most hay fires usually occur within two to six weeks of baling, but may occur in hay several years old if the hay is rewetted or mixed with newly baled hay.

Table 1. Effects of Internal Bale Temperature on Fire Potential

TEMPERATURE RANGES (F)	COMMENTS
< 130	Minimal fire risks.
130 to 140	Minimal fire risk. Continue checking.
150	Moderate fire risk. Check frequently.
175 to 190	Fire is imminent. Call the fire department.
> 190	Use extreme caution. Bales may combust when moved.

ADDITIONAL STEPS TO REDUCE THE RISK OF HAY FIRES.

- If buying hay out of the field, the moisture content must be known.
- Storage of hay prior to purchase reduces the risk of hay fire for buyers.
- Hay should be stacked to encourage air circulation. The hay storage area should be protected from rain.
- Do not mix piles of newly baled and previously cured hay.
- Forage moisture testers can be used to estimate in-field moisture. However, testers vary in accuracy and several samples need to be taken.
- Propionic acid can help prevent molding when hay is baled between 17 to 25% moisture, depending on bale size.
- If possible, store hay in a separate area or building from where animals are housed. This does not reduce the risk of a hay fire, but will limit animal loss if a fire occurs.

More information is available on the Forage Website.

Author: *Krishona Martinson, PhD, U of M Extension.*

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Programs and Events

2008 Regional Forage Programs

Tuesday, February 12
Holiday Inn
Highway 10 East
Detroit Lakes, MN

Wednesday, February 13
Joseph's
311 Blattner Drive
Avon, MN

Thursday, February 14
Savanna Portage Restaurant
102 West Highway 2
Floodwood, MN

Friday, February 15
Heintz Center
1926 College View Rd SE
Rochester, MN

Contact: Paul Peterson
at peter072@umn.edu for more information.

Keeping Stored Bunk Forage at High Quality

The harvest season is over. The forages are now in storage to be used in the months ahead, mixed into a ration, and fed to your cattle. However, only part of the job in delivering high quality forage to your cattle is done. Do you have the proper management practices in place to keep your forages in a high quality condition? Will you have as much high quality forage when next spring and summer roll around as you are planning to have?

It is important to have minimum forage losses and spoilage in stored forage. It is important to maintain forage quality from field to the feed bunk. Remember, most forage dry matter losses occur during storage and feed out. In fact, in a 1995 research study, Roth and Undersander found that feed out losses can represent up to 30% of the total dry matter loss in the ensiling process.

So, assuming you harvested the silage at the correct moisture content, have packed the bunker or filled the silo bag at the appropriate density per cubic foot (to keep air out for proper fermentation), have sealed the silo correctly, what else needs to be done to avoid losses?

Here is a list of items to check:

- Make sure plastic covers on bunkers or the silo bags are protected from punctures by rodents, livestock, dogs, cats, and wild animals.
- Conduct weekly inspections and repair holes in the plastic to exclude air and water.
- Before winter sets in, mow and cleanup around the bunker silo and bags to discourage rodents.
- When feeding out, only the amount of silage that will be fed in a short period (< 3days) should be uncovered at one time. Slow feed out rates allow more time for losses due to the growth of yeasts, molds, and aerobic bacteria.
- Never scoop silage from the face as this allows more air to enter, resulting in spoilage.
- Maintaining a smooth, firm face and cleaning up loose silage from the bunker floor or around the bag on feed out will help minimize aerobic losses.
- Consider using a facer to maintain a smooth face (see photo). In a 2001 Wisconsin field

study, Sutter and Shaver found no reduction in effective fiber using facers when compared to either hand removal or unloaded-bucket removal.



Remember, if spoiled silage does occur, do not try to stretch silage inventories by feeding it to cattle. Feeding spoiled silage, even at 5% of the total DM, will reduce intake. Spoiled silage can partially or totally destroy the forage mat in the rumen. Also, feeding spoiled silage to heifers and dry cows has a negative affect on fertility and reproductive performance.

Right now is a good time to review your forage storage management practices for the months ahead. Then, discuss those with your farm employees who are involved.

Author: Neil Broadwater, U of M Extension

Quality-Tested Hay Auction Results Available

The "Quality-Tested" Hay Action at Sauk Centre, MN was started by the Central Minnesota Forage Council and the University of Minnesota to promote quality forage testing and to create a marketplace for buyers and sellers of hay. The auction has since been turned over to a privately owned company.

Sales are held on the first and third Thursday of each month from September through May. Loads need to be in place by 10:30 a.m. (so forage samples can be taken), and the sale starts at 12:30 p.m. The auction is at a new location

beginning in September of 2007. From the intersection of US Highway 71 and I-94 in Sauk Centre go 1/2 mile south on US Highway 71. At Modern Farm Equipment, turn left and travel about 1/10 of a mile east on 408th Street to the auction site. Delivery of purchased hay from the auction site is negotiated between the seller and the buyer.

A summary of price and forage quality data, including historical data can be found on the MN Crop e - News website at www.extension.umn.edu/cropnews

This summary lists the lots sold by groups based 25 RFV points and bale types. The average price for each group and the range of prices for each group is listed.

For example, on October 18th, there were 13 loads of medium square alfalfa bales in the 126-150 RFV group. Prices for this group ranged from \$125 to \$180/ton with an average of \$152/ton.

Contact Dan Martens (1-800-964-4929) to receive the report or with additional questions.

Author: Dan Martens, U of M Extension

Corn Stover and Sweet Corn Silage as Alternative Forage

If you are short of forage this year, some alternative forages may be of benefit to your farming operation. For dairy, allocate your highest quality forage for the milking herd and youngest heifers. For beef cows, you may choose to save some for calving time.

Corn stover is commonly used as a forage alternative for beef and dairy animals. Running beef cows and dairy heifers on harvested fields has been a low cost way to harvest stover. As a rule of thumb, for every 35 bushels of corn harvested, there is one ton of stover dry matter per acre. A 150 bushel corn crop would yield over four tons of stover. Stover can be baled, stacked, grazed or chopped

and bagged at 40 to 50% moisture.

Sweet corn silage or cannery waste can be a low cost forage available in certain areas. As you can see from the table 1, it compares favorably with regular corn silage in feeding value.

With a growing supply of corn distillers, many producers use this source of protein, energy and fiber in

rations. Wet corn distillers, where available, can also help stick feeds together and make a palatable TMR. Caution must be used when feeding corn distillers grains due to high levels of fat, phosphorus and sometimes sulfur. If fed over 10% of ration dry matter, heifers may become overweight. *Author: Jim Paulson, U of M Extension*

Table 1. Nutrient Analysis of Alternative Forages and Feeds for Cattle

	Corn Silage	Sweet Corn Silage	Corn Stover	Ground Corn	Corn Distillers
	-----%-----				
CP	9	9	5	9	30
NDF	45	55	65	9	39
TDN	70	67	45	88	79

Winter Feeding Strategies for Beef Cattle

Winter feed costs are the single largest expense in a cow/calf operation and will vary from year to year depending on the quality of forage, cost and availability of winter feed supplements, animal type, animal body condition, and calving date, if applicable. Having the flexibility to adjust your winter feeding program will lower winter feeding cost. For example, dry cows require feed lower in quality than nursing cows, and young replacement animals require feed higher in quality than mature animals.

Generally, winter feeding is accomplished with harvested forages, mainly hay and silage. One can estimate, based on dry matter (DM) intake/head/day, how much winter feed is needed per animal during the winter feeding period. A 1200-lb. pregnant beef cow will typically require 25 to 30 pounds DM/day which equates to approximately one round bale of hay (1000 lb. bale, as fed) per head per month. Diets consisting of a minimum 55% total digestible nutrient (TDN) and 8% crude protein (CP) will meet the nutrient needs of

pregnant dry beef cows. Typically, most cool-season grass and legume hay contain the required nutrients needed for pregnant dry beef cows (see Table 1). Test your forage to determine exact nutrient contents.

Depending on forage quality, supplementing may be necessary. Nutrient demands are much higher for young replacement animals, pregnant first- and second-calf heifers, and lactating cows. When requiring a TDN or CP supplement, compare nutrient composition of the diet with nutrient requirements of the animal and determine what nutrient(s) are needed in the diet. Nutrient requirements of the diet for

these animal types should meet or exceed TDN at 60-65% and CP at 11% for maintaining a body condition score (BCS) of 5 to 6 (9-point scale; 1 = emaciated and 9 = obese). Nutrient demand increases (TDN = 66-70%; CP = 11-13%) for fall calving first- and second-calf heifers during the winter months due to lactation.

Regardless of the content of the diet, cattle must uphold a BCS of 5 to 6 throughout the winter, if not two months prior to calving. It is generally accepted that a BCS of 5 to 6 is optimum for reproduction. *Author: Ryon Walker, PhD, U of M Extension.*

Table 1. Average values for dry matter (DM), crude protein (CP), and total digestible nutrients (TDN) of common grass and legume hays, and corn silage (Source: National Research Council, 2000).

Description	% DM	% CP	% TDN
Corn Silage (40% grain)	33	9	66
Alfalfa Hay (mid-bloom)	91	17	60
Brome grass Hay (mid-bloom)	88	14	56
Orchardgrass Hay (mid-bloom)	90	11	60
Reed Canarygrass Hay	89	10	55
Timothy Hay (mid-bloom)	89	10	57

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Wheat as a Companion Crop for Alfalfa

The high value of wheat grain has renewed interest in its use as a companion crop for establishment of alfalfa and other forage crops. Currently, oat is the most commonly used companion crop for alfalfa establishment. Research was conducted at three locations in southern Minnesota to evaluate alternative companion crops for establishment of alfalfa.

Alfalfa yields in the year following seeding were greater when established with wheat than when established with other small grains (Table 1). Alfalfa yields were least when seeded with a pea

companion crop. Assuming current market prices, wheat and barley would be the most profitable small grain and oat the least profitable. It is important to note that variation in grain price and grain yields will influence the potential economic returns.

There are other factors to consider in selecting and managing a companion crop, including; selecting earlier maturing and shorter stature varieties; reducing the seeding rate; and promptly removing straw.

Author: Craig Sheaffer, PhD, U of M

Table 1. Grain and Alfalfa Yields when Alfalfa was Seeded with a Small Grain.

Cover Crop	Seeding Rate ⁽¹⁾	Grain Yield	Alfalfa Yield ⁽²⁾	Alfalfa Yield ⁽²⁾
	bu/acre	bu/ acre	2006	2007
Spring oat	2.5	66	0.4	4.2
Spring wheat	1.9	47	0.5	4.5
Spring barley	1.8	63	0.4	3.9
Field pea	3	29	0.2	3.2
Annual flax	0.75	12	0.4	4.3
No Companion Crop	—	---	--- ⁽³⁾	3.8

⁽¹⁾ Alfalfa seeding rate was 12 lbs/acre. ⁽²⁾ Alfalfa yields from 1 harvest in 2006 and 3 harvests in 2007. ⁽³⁾ No yield was taken in 2006 due to high weed pressure. No herbicides were used to establish crop.

Plan to Attend the 2008 Forage Days

The University of Minnesota Extension Forage Team will be hosting 4 Regional Forage Programs in February 2008. Dates and locates are: February 12, Detroit Lakes; February 13, Avon; February 14, Floodwood; and February 15, Rochester.

This year's topics include forage molds and toxins, alfalfa and grass management,

variety selection, and biomass.

Programs begin at 10:00 am (registration at 9:30 am) and conclude at 3:00 pm. The cost to attend each program is \$30 and registration is taken at the door. The registration fee includes lunch and a proceedings.

Upper Midwest Hay List (www.haylist.umn.edu)

The Upper Midwest Hay List is a website designed to connect livestock owners in need of hay with farmers who have hay to sell.

The website is a cooperative effort among Extension Services in MN, IL, WI, and SD. There is no charge to list hay or to search hay listings, but buyers and

sellers will need to register. Hay information is not verified by the Extension Service.

For additional information or assistance, please contact the Farm Information Line at 1-800-232-9077.

The website address is: www.haylist.umn.edu