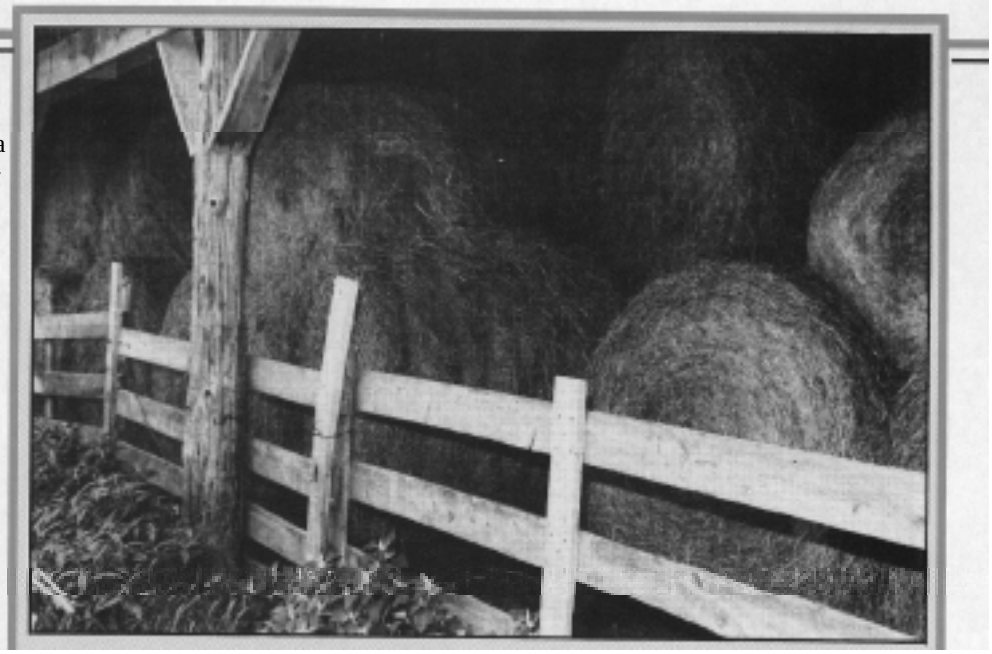

One of Fine Arts of the Stockman is Making Hay

By Jim Cotton, Editor

Putting up a well-tended hay crop is a high point of the rural year. But successfully moving that crop from the stump through the windrow to the feedyard or fencerow can slump to the low point in that seasonal cycle.

Nothing worthwhile comes easy, given weather, insect attacks, and machinery breakdowns.

We remember feeding several stacks of Colorado meadow hay put up too wet. Spontaneous combustion took its toll. The cows didn't seem to mind, and in fact, some sought out the caramelized flakes with relish. But we couldn't haul it fast enough. Low in protein, poorly digestible, and way below margins in energy, it was like offering candy to those black cows. That winter, we fed a daily protein-mineral-vitamin supplement to keep the cows moving and the local Purina mill in business.

Many gemlins appear in the making of hay, frustrating the best of preseason intentions. An agronomist can advise us concerning seedbed preparation, seeding rate, grass-legume mixtures, weed control, insect warfare, and stand maintenance. But, for our purposes here, let's suppose most of us have a mixture of new legume stands, old legumes, grass-leg ume combinations, native meadows, or rough, coarse bottomland where we try to retrieve some winter forage.

What methods, products, or tactics can we apply to decently save what we can and perhaps even improve upon its quality and palatability?

Howell N. Wheaton, extension forage specialist at the University of Missouri-Columbia, reminds us of that old nemesis-intake-as the major factor in determining forage quality. A cow simply will not eat as much of a low energy-high fiber diet. Allow that energy level to slip below minimums and optimum production will suffer.

Wheaton points out some characteristics of high quality forages:

- •contain a reasonable amount of legumes
- •high proportion of leaves to stems
- •stems are fine and soft
- •low cellulose content
- •low lignin (woodiness)
- •high levels of crude and digestible protein
- •high levels of sugar and simple carbohydrates (promotes digestibility).

Legumes in the forage provide not only slightly higher levels of protein and total digestible nutrients, but clovers and alfalfas also pass through the rumen more quickly compared to grasses. Legumes have less cell wall material, which Wheaton says explains this rapid rate of passage. Grasses, on the other hand, vary in cell wall content. Warm and cool season grasses are similar in cell wall content when immature, but during rapid growth and dry matter accumulation, the warm seasons species tend to produce more cell wall content than cool season grasses. Legumes too will present a more "woody" nature if harvested after the early stages of maturity.

Late harvest of hay can create some staggering losses according to Wheaton, He lists four sources contributing to a reduction of the hay's potential feed value:

- •Late cutting can create a 20 percent loss in digestibility.
- •Wilting losses in the swath accounts for a five percent loss typically.
- •Leaf shatter can reduce feed-value up to 25 percent.
- •Too-high moisture at baling can produce losses in value of between 15 to 25 percent.

Grim estimates, those, but most extension personnel who work with forage harvesting and preservation agree: Improper handling and storage of hay can produce nutrient losses of 60 percent or more. So the challenge becomes applying whatever's within our control in the race against time, weather, and the natural deterioration of forage quality.

Wheaton recommends harvesting legume-grass mixtures when the legume reaches the desired stage of maturity regardless of the growth stage of the grass. Most students of legumes also recommend harvesting at the bud to one-tenth bloom stage. The goal becomes holding a high leaf-to-stem ratio. Animal scientist James Russell and plant pathologist Dwayne Buxton, both from Iowa State University, suggest the leaf-to-stem ratio may drop from 1/0–equal stems and leaves-at the early bud stage, to 0.5-one-third leaves and two-third stems-by the mid-flower stage. We all know how short and critical that time span can become.

A swather breakdown or inclement weather can put the producer in a catch-up position. Can he make it up by "going faster" when finally in the field? Not likely, says Bobby Tyson, extension engineer from the University of Georgia.

"The speed of mowing.. . can make a

big difference in the amount of hay lost," says Tyson. "In general, the faster you mow, the more hay you lose. Using a common cutterbar mower, you can expect about a one percent hay loss moving at one mile an hour. But at six miles per hour, losses increase to nearly six percent."

Of course, time of baling varies widely across the country depending on the "dew" hours, but for his region, Tyson suggests baling at night preserves quality and avoids leaf shatter.

Most professional haymakers use crimpers/conditioners to reduce dry matter loss, shorten curing time in the swath, avoid undue exposure to weather and its changes, counter excessive leaf shattering and respiration losses. Kevin Shinners of the University of Wisconsin ag engineering department urges producers pay careful attention to their conditioner's settings. He believes underconditioned hay requires an extra full day to dry under typical midwestern conditions in the summer.

"A majority of the stems should be crimped every 3-4 inches," Shinners states. "You want a slight bruising of the leaves, but excessive bruising causes leaf loss. If you see no leaf bruising you probably aren't crimping enough." According to Shinners, the slower the drying rate, the greater the dry matter loss. Extension specialists and professional hay marketers and harvesters recommend adjusting conditioners often throughout the cutting and particularly between crops as volume changes from first crop through the second and third.

Respiration losses of the dry matter content are normally five to six percent, and most experts agree, little can be done to correct it. Wheaton points out forage plants continue to breath (respire) until the moisture content drops below 40 percent.

Crimpers/conditioners are but one tool to enhance good windrow management. In some areas of the country, tedders are employed to fluff the windrows and speed drying. A variety of machines and approaches are available. Experience seems to indicate the practice, commonly used with grass hays, can be applied to alfalfa and clovers if care is taken to not abuse the windrows and contribute to leaf loss. Most farmers suggest tedding shouldn't be considered a standard procedure but one to be followed depending on the weather, drying conditions, and the forecast predicted until baling can begin.

Baling and storage emerge as the double-headed opportunity for haymakers. Proper baling and attentive storage can retrieve a less-than-ideal situation or prevent some so-so forage from becoming a disaster feed of little value. Here are some tips.

Excessive moisture can spell the undoing of good hay management. Like the stacks mentioned earlier, hay temperatures in the stack of above 150 degrees F. are an invitation to spontaneous combustion and the potential loss of the bulk of the crop. Temperatures of 105 degrees F. or more will compromise hay quality. How does one avoid a "hot" stack?

Wheaton says the key is keeping moisture levels at baling to 20-22 percent. Heating, molding (raising the possibility of toxins released by the moldy growth) and of course, fire, are consequences of baling poorly cured windrows.

Extension Sheep Specialist Rodney Kott and his beef counterpart at Montana State University, Roger Brownson, advise producers that field cured hay can be expected to lose three to four percent of its total dry matter in storage. However, if that hay was baled at 30 percent dry matter, producers should expect losses of 10 percent. A 10 to 15 percent loss in digestibility is common, say the specialists, through heating. Wheaton points out hay that's properly baled with attention to moisture in the windrows should not lose more than five percent of its digestible nutrients if stored under cover. Carotene, precursor of Vitamin A, will decline, a fact well-established by research.

Georgia engineer Tyson addresses a particular problem of large bales and outside storage when he says, "Rain causes leaching of nutrients and breaks the fragile leaves. It's important to remember the outside six inches of the round bale contains up to one-third of the hay in the entire bale. Tyson cites research findings showing losses of 14 percent from barn-stored round bales to 51 percent loss of nutrients from bales stored on the ground and uncovered.

There are many ingenious methods of preserving round baled hay today, most involving a plastic bonnet or bag. The investment is likely justified if the forage is high in quality to start with.

Open storage can be improved by placing large bales on well-drained areas or on poles or crushed rock to retard spoilage on the bottoms. Sitting the bale rows parallel with prevailing winds also helps.

Bales placed end-to-end should be the same size, Wheaton recommends. Cone-shaped bales or bales of different diameters will create excessive spoilage when placed end-to-end. Try to provide three feet minimum spacing between bale rows, and leave at least two feet between bales stored side-by-side, says Wheaton. Avoid storage under trees or in the shade of buildings where moisture can drip or snow drifts accumulate.

Also, it should be noted hay packaged in the large bale formats retains internal heat much longer than the conventional square bale. Studies show round bales remaining at 120 degrees F. for 20 days or longer suffer excessive losses in dry matter and digestibility of both protein and energy. This can be especially serious with grass hays which are borderline at best in protein content even when freshly cut.

Hay preservatives are the subject of some attention. In the past, some producers salted their hay as it went into the loft or mow. The practice has been of some benefit with loose hay, but high moisture hay that's been baled may present some different economics. The amount and price of salt to correct

molding and heating would be prohibitive, thinks Wheaton, and could adversely affect palatability.

Organic acids such as propionic, acetic, and formaldehyde have been used successfully in retaining the feeding values of hay. These substances act as fungicides against mold formation. Formaldehyde kills bacteria plus it binds protein in a manner that preserves it.

But seeding hay with an acid is not a cure-all or surefire preventative. Local experience should dictate amounts and procedures. If the moisture content is between 25 and 30 percent, Wheaton recommends a 20-pound application per ton. Double that for hay registering between 30 and 35 percent moisture. Hay baled within the preferred 25 percent range or lower could be treated with 10 pounds per ton. Ohio State University findings indicate stacks exhibiting more than 25 percent moisture at stacking will heat excessively regardless of the amount of acid applied. Of course, if one is applying corrosive acids (or salt), measures should be taken to wash down balers and other equipment.

Publicity surrounding treating hay with

anhydrous ammonia has been widespread. Much of the ammonia applied will be retained within the hay and as such increases the crude protein content to a degree. Application also seems to help digestibility of the cell wall fiber.

Applying ammonia is not an easy undertaking or even practical, in some cases. Dr. Scott Barao, extension beef cattle specialist with the University of Maryland, suggests any producer choosing this route should stack his round bales at least two high and two or three bales wide. Regardless if the bales are round or square, an accurate estimate of the total tonnage of the stack to be treated is necessary.

A tent of plastic sheeting needs to be draped over the stack and sealed with dirt. A delivery pipe or hose with an external shut-off should be installed near the center of the stack to pump ammonia directly into the tent. Approximately 60 pounds per ton of roughage is recommended.

Barao says care should be taken to permeate the stack evenly with bales remaining covered for one to four weeks, depending on the outside temperature. One week to 10 days has been found sufficient in hot weather. Bales should be aerated several days before being fed.

Safety precautions include a gas or oxygen mask and a large container of water to flush ammonia off the applicator should he come in contact with this toxic gas.

Doug Porter could sell hay at $315 a ton and not be overcharging. What's more, he has the trophy to prove it.

Porter, ABS Farm Manager, and his crew at the American Breeders Service (ABS) farm near DeForest, Wisc.-like many farm operations-run test plots to evaluate the yields and quality of new alfalfa varieties and new corn hybrids. They use the results primarily in later seed selection. But the test plots gave them an extra payoff in 1985 when one of them produced the winning baled hay entry in the *Holstein World's* Second Forage Analysis Super Bowl at World Dairy Expo in Madison, Wisc. It bested 153 other contestants.

Their entry, which came from the third cutting off a second year plot, was valued by contest officials at $315 a ton on the basis of milk production. It was 95 percent alfalfa and 5 percent orchardgrass. The judging was based 60 percent on forage analysis, 20 percent on visual and odor traits, 10 percent on milk yield per ton, and 10 percent on farm information.

Porter points out that the ratio of orchardgrass to alfalfa increases each year the stand ages and eventually will reach a 60 percent alfalfa, 40 percent orchardgrass balance. This makes a more desirable Forage ration for bulls because, unlike dairy cows that are producing large quantities of milk, their calcium requirements are lower,

The key to growing prize-winning hay?

"We believe it's principally attitude and approach," says Porter. "The attitude of our crew is to produce the best quality forage available and to do it at a reasonable cost.

"We've found that good quality hay starts with high quality seed. We test three to six different seed varieties at a time in our plots for yield and protein and we purchase only the best-performing seed even if it's high-priced compared to most. According to our experience, it more than pays for itself. For example, that winning plot produced 7.42 tons of hay in its first year and that was with a nurse crop."

Porter also evaluates a new variety For vigor, longevity, and disease and insect resistance. He says fertility is another of his critical considerations.

"We soil test every other year and fertilize for eight tons per acre on our usual mix of 60 percent alfalfa and 40 percent orchardgrass. Generally, we plow down about 30 tons of manure per acre per year and it contains wood shavings which tie up the nitrogen. Therefore, we need to adjust for that with a usual rate of 20 units of sulfur, six units of boron, and six units of zinc, plus recommended amounts of phosphate and potash.

"One of the important things when interpreting fertility recommendations is to apply fertilizer in terms of units, which are the actual pounds of each nutrient. Otherwise, you will come up short."

The ABS crew starts cutting hay in its southern Wisconsin location about June 1, which is typically the early bud stage, and then cuts again at 30-day intervals. They stop after mid' September and wait for the first killing frost before making their final cutting. "We don't feel a stand is hurt by the late cutting if fertility is high and the crop is vigorous," says Doug. "By harvesting every 30 days we practically eliminate pests such as the alfalfa weevil and pear aphid."

The regular and frequent cuttings also help control weeds by preventing them from going to seed.

Porter has been assessing a drying agent (desiccant) on some of his hay ground, including the plot which produced the prize winning entry. The drying agent is applied at the time of cutting. He uses a product called Pro Dry from American Farm Products Inc. and says it reduces drying time by one day. "But that varies with the cutting," he points out. "It's more effective on second and third cuttings than on the first cutting."

The drying agent acts by altering the waxy covering on the stems of legumes, allowing faster evaporation.

Porter applies 10 pounds of actual material per acre at a cost of 75 cents per pound. "At this point we're still evaluating the use of a drying agent," he notes. "We're looking at cost in relation to results."

Doug also applies a preservative, Field Fresh, to his baled hay. It's 80 percent proprionic acid and 20 percent acetic acid and goes on at baling time,

On their winning hay entry, the ABS crew cut the field early on a Monday morning and applied the drying agent. They let the hay dry for one day but did not rake it. Then, early on Wednesday morning they sprayed 30 pounds of actual material per acre on the preservative and baled while the dew was still on.

The ABS farm produces 425 total acres of hay, primarily the 60 percent alfalfa and 40 percent orchardgrass combination. Most goes into the silo.

"We shoot for a balance of tonnage and protein in our hay," says Porter. "Our goal is an eight-ton yield and 14-18 percent crude protein when cut at the bud stage."

Application should be conducted in open, well ventilated areas. Restrict access to the area for several days until the gas is well-absorbed by the hay.

Barao lists costs for application to run $9 to $11 per ton, including $3 to $4 per ton for the plastic.

While hay producers may shrink at the added expense, the treatment has been shown to improve digestibility by eight to 15 percent plus it can improve protein content six to eight percent. Expect consumption to increase by15 to 25 percent, says Barao.

However, not all students of hay improvement endorse ammonia. University of Missouri-Columbia agronomist Jimmy Henning finds a shot or spray of urea to be equally effective without some of ammonia's drawbacks.

"We were able to increase digestibility by 10 percent by mixing urea with poor quality hay," Henning reports. "In some cases, we were also able to double the crude protein-from six to 12 percent." In his report to the American Society of Agronomy, Henning suggested application rates should range from about two to four percent of the dry weight of the bale. Cost estimates vary from $5 to $10 per ton, which some farmers claim is not worth the time or cost. "But, at least it offers you the prospect of turning terrible hay into good feed," says Henning.

Urea offers several advantages over ammonia, Henning believes. It is readily available and easy to store and handle. Urea can also be applied at baling, eliminating the need for a post-baling operation. Third, urea poses no health hazard to the farmers applying it nor the cattle consuming it at the recommended rates. "Ammoniated hay can cause hyper-excitability, convulsions, and death with cattle," Henning states.

In UMC studies, temperatures in hay treated with urea were as much as 45 degrees cooler than untreated hay, even with hay moisture content above 40 percent. Urea treatments, according to Henning, are most effective when hay moisture levels are between 25 to 40 percent.

Today, it's not simply "making hay" but "managing hay" that counts. Given poor weather at harvest, mechanical breakdowns, or other compromises, the hay farmer still can make the best of a bad situation by applying some of the tools and techniques available. Though they may be skeptical at first, producers everywhere have found attention to moisture and other details paid off in better stacks, better feed.

New baling twine offered

Bridon Cordage Inc. of Albert Lea, Minn., has announced development of a new polypropylene baling twine for large round bales. The product is named Bridon ULTRA.

According to company officials, the new twine provides hay producers all the benefits of using a regular synthetic twine plus extra advantages:

- Increased tensile strength
- Distinctive high-visibility blue color
- Greater cost efficiency

The new twine is distinctively smaller in circumference than regular synthetic twine yet has the same uniform consistency. The new manufacturing process allows a greater weight-to-strength ratio meaning fewer broken bales and less downtime for the producer. The blue color improves visibility on the hay bale itself.

The new product is available now in much of the Midwest plus Texas and Oklahoma and is available in two models: ULTRA and ULTRA II.

The specifications:

	ULTRA	ULTRAII
Tensile Strength	125 pounds	150 pounds
New weight	17 pounds	20 pounds
Footaae	20,000 feet	20,000 feet

For more information and a free full-color brochure on Bridon ULTRA and ULTRA II, call (800) 533-6002 outside Minnesota, (800) 222-6212 in Minnesota. Or write: Bridon Cordage Inc., 909 16th St., Albert Lea, Minnesota 56007. AJ