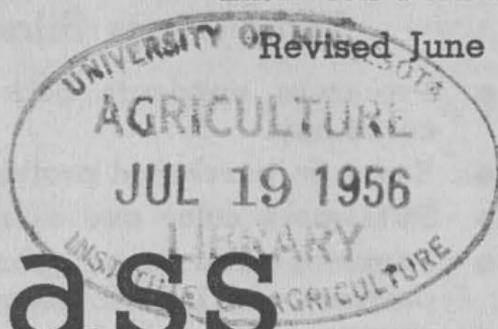


Extension Folder 181

Revised June 1956

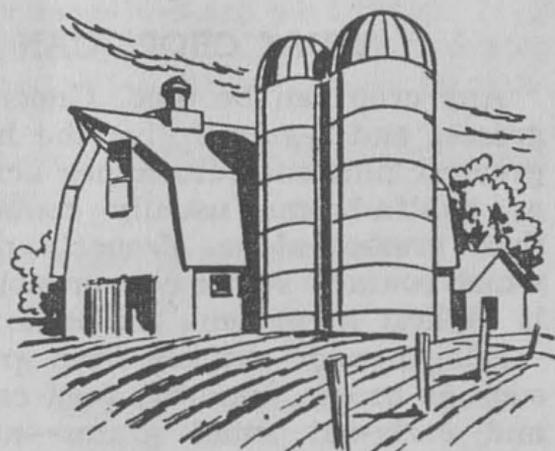


# Grass Silage

Rodney A. Briggs

and

Harold R. Searles



UNIVERSITY OF MINNESOTA  
*Agricultural Extension Service*  
U. S. DEPARTMENT OF AGRICULTURE

## Why Grass Silage?

- Preserves nutrients better than field-cured hay.
- Saves on purchased proteins.
- Puts more color and vitamins in milk.
- Provides canned feed (from extra spring pasture) during midsummer pasture slumps.
- Avoids spring weather hazards.
- Cuts losses from hay put up at high moisture.
- Cuts feed value losses that come with a delayed harvest.

Grassland farming—with emphasis on high-quality pasture, grass silage, and hay—is becoming increasingly important in Minnesota. Minnesota farmer are using more and more high-quality forages to cut the cost of producing milk and meat.

The modern farmer strives for flexibility in producing these forages. He plans his seedings so that they can be used for pasture, grass silage, or hay, depending on his feed needs and the weather.

This folder deals with one phase of forage production—grass silage.

### WHAT CROPS CAN I USE?

Any crop can be used. Generally, tall-growing grasses and legumes give the highest yields and greatest nutrient return per acre. Mixtures such as alfalfa-brome usually contain more protein than grasses alone. Properly made grass silage which contains 60 per cent or more alfalfa or clover is highest in protein, minerals, and carotene.

Silages made entirely from grasses or cereals—such as brome, timothy, reed canary, sudangrass, and early-cut small grains—are palatable and good, but they have less protein than legume silage.

You can make excellent supplemental silages by using sorghum, sudangrass and soybeans, millet, or oats and peas.

### WHEN SHOULD I CUT?

Cutting at the proper time is essential to get maximum feed value. Start cutting before the recommended time so that the field will average the right stage of maturity. For highest yields without hurting the stand, cut—

**Alfalfa, first crop**, as near one-tenth bloom as possible or when new crown shoots appear.

**Alfalfa, second crop**, at half-bloom.

**Red clover**, at half- to three-quarters bloom.

**Sweetclover**, just as plants start to blossom.

**Grasses, brome and timothy**, after heading but before blossoming.

**Reed canarygrass**, early—before heading.

**Small grains**, late milk to early dough stage.

**Sorghum**, as top seeds reach dough stage.

**Sudangrass**, after heading but before fully headed.

**Mixtures of legumes and grasses** should be cut when the major species reaches its proper cutting stage.

## WHAT KIND OF SILO DO I NEED?

You can use upright, horizontal, or temporary silos. All must be as airtight as possible to prevent molding and rotting and must have good bottom drainage. They must be constructed to permit proper packing.

### UPRIGHT SILOS

Upright or tower silos normally provide the best conditions for excluding air. As grass silage has greater weight than corn silage the silo must be constructed to withstand greater pressures. New silos in most instances will handle grass silage. Old silos may have to be reinforced with extra hoops on the lower two-thirds of the silo. Adequate bottom drainage is desired.

### HORIZONTAL SILOS

**1. Beneath-the-ground or trench silo**—Provide for adequate bottom drainage by slightly ridging the center of the bottom. For good drainage in many areas it is necessary to lay drainage tile at each side of the trench for the entire length.

Usually one end of the trench is open to make it easy to remove silage. The other end is sloping to allow for entrance or exit when filling. Walls should slope outwards 1 foot for each 4 feet in height.

Running a wagon and tractor over the pile as it is built does an effective job of packing.

**2. Half-in and half-out of the ground**—You can build this type of silo by bulldozing a trench and piling the soil on the sides for additional depth. You may have to scoop some extra soil along the sides.

**3. Above-the-ground silo with retaining walls**—A bunker silo—This type of silo can be built in any location. For best results it should be built on a concrete floor and have semi-permanent or per-

manent walls. Wooden staves from an old upright silo have been used satisfactorily.

The side walls should be sloped 6 inches for every 4 feet in height to permit proper packing. Paving the bottom makes loading, unloading and self-feeding easier. A design that allows for lateral bottom drainage by leaving a 1-inch opening between the base of the wall and the floor has worked well. Mound the silage on top for good surface drainage. Never have less than 6 feet of settled silage in a horizontal silo, as less will increase losses due to leaching and spoilage.

Plans for a horizontal silo can be had by sending for M-126 and M-127, "Horizontal Silo," from the Bulletin Room, University of Minnesota, St. Paul, Minnesota.

### **TEMPORARY UPRIGHT SILOS OR STACKS ARE WASTEFUL**

Temporary silos can be made with snow fence, wire fence and paper, baled hay, or straw, or the green material can be just stacked on top of the ground. **With this type of silo, outside spoilage is high, and poor packing increases spoilage due to heating, molding, and rotting.**

### **Self-feeding Bunker or Trench Silos**

Bunker or trench silos can be self-fed satisfactorily. Self-feeding requires free access to the silage throughout the day. Allow 3 to 6 inches of feeding space per animal unit. Semi self-feeding by removing silage with an unloader or scoop and putting into feed bunks allows for shorter periods of feeding. For self-feeding, 6 feet of settled silage is desirable.

### **WHAT IS GRASS SILAGE?**

Silage is the result of bacterial fermentation on green plants or where green material has been preserved by inhibiting fermentation by chemical action.

When fermented, this is brought about by the action of bacteria on sugars or other fermentable carbohydrates within the plant. This action produces enough acid to "pickle" the grass and stop fermentation.

Legumes, unlike corn, are low in sugars and high in protein. This favors the production of bacteria that form butyric acid instead of bacteria that form desirable lactic acid. The butyric acid-forming bacteria may cause ill-smelling, unsatisfactory grass silage.

To insure high quality silage, a proper fermentation is necessary. This can be achieved by wilting to a 65-70 per cent moisture content or by adding preservatives, or both. Delayed harvest will favor a desirable fermentation, because a plant increases

in carbohydrate content and decreases in moisture content and protein with age.

Insuring a desirable fermentation by delayed harvest can considerably lower the feed value of that silage and is generally considered a poor practice.

### SHOULD I USE A PRESERVATIVE?

Ordinarily with high-moisture, straight legumes or a legume-grass mixture, preservatives are recommended. With grass or heavy grass mixtures cut at the proper stage, preservatives may not be necessary but may improve the silage.

Using a preservative does not always guarantee a good silage, but it will give you more leeway in silage operations. Preservatives normally insure good quality, palatability, and eliminate foul and stinky odors.

Cost will depend on the amount and kind of preservative used. With carbohydrate preservatives with little seepage, 80 per cent or more of the preservative's feed value may be recovered in the silage.

The cost of fermentation-inhibiting chemicals must be charged to preservation, because these preservatives have no feed value. However, experiments indicate that these preservatives cut fermentation losses, so the value of nutrients saved may more than pay the cost.

### WHAT PRESERVATIVES ARE AVAILABLE?

Two types of preservatives are used today:

1. Sugars or other fermentable carbohydrates such as molasses or ground grain that aid fermentation.
2. Chemicals such as sodium metabisulfite that inhibit fermentation.

#### How Much Preservative Should I Use?

Preservative	Legumes	Legumes and grass mixture	Grass and immature cereals
Liquid molasses .....	80-100	60-80	60
Corn and cob meal .....	200-250	150-200	150
Ground grain .....	150-200	150	100
Beet pulp .....	150	100	100
Sodium metabisulfite .....	8-10	8	8

### HOW DO I ADD PRESERVATIVES?

**Dry preservatives** such as corn and cob meal, dry molasses, or ground grains mix well with green material. Add these preservatives at the blower or spread them over the load before unloading.

For best results, **liquid molasses**... should be pumped to the top of the blower pipe. It may be

added by gravity at the blower. Some type of quick shutoff valve is needed to control flow of molasses. Minnesota-produced beet molasses will work as well as cane or black strap molasses.

Add **sodium metabisulfite** at the blower with a converted corn planter-fertilizer attachment or other such device.

Do not add on top of the load. Good mixing is very important. Plans for making a applicator for sodium metabisulfite are available from the Agronomy Department, University of Minnesota, St. Paul, Minnesota. There have been some reports of sodium metabisulfite causing skin irritation. Level and pack between loads.

## **HOW MUCH DOES GREEN MATERIAL WEIGH?**

A cubic foot of freshly cut green material in a wagon will weigh approximately 25 pounds if settled, and about 20 pounds if loose.

## **WHAT ABOUT MOISTURE CONTENT?**

Moisture content determines how good a packing job you do, how much seepage you will have, and if too wet, what kind of fermentation you will have. When grass is too dry it is hard to get an airtight pack, and poor-quality silage results.

At the proper cutting stage, grasses are close to the desired 65-70 per cent moisture content. However, at the proper cutting stage, straight legumes like alfalfa or clovers or mixtures of grasses and legumes are still too high in moisture content. Even when using preservatives a slight wilt may be desirable.

Wilt these legumes only long enough so that a handful of chopped material held in a tight fist for half a minute will slowly spring up and fall apart in chunks, leaving your hand moist. If it falls apart, it is too dry. If it remains in a ball, it is too wet.

When using preservatives, home-grown grains help to increase dry matter content of high moisture material and also supply sugars for fermentation.

Chopped green material that is put into a horizontal or temporary silo should be higher in moisture content than that put into an upright silo.

Long grass silage has not been dependable.

## **HOW FINE SHOULD I CHOP?**

Length of cut as well as moisture content determines how well grass silage will pack. High-moisture material may have a ½- to ¾-inch cut. For wilted material, cut as fine as your equipment will allow. A ¼-inch cut is best for good packing. Be sure that the knives are sharp and properly adjusted.

## **WHAT ABOUT PACKING?**

In vertical silos the weight of the grass makes packing in the lower two-thirds unnecessary. But as you fill the upper third, keep silage slightly higher next to the walls and pack following each load. When the silo is filled, mound the center and continue packing daily until settling stops.

The best way to pack a horizontal silo is to use a wheeled tractor to level the load as filled, continuing as long as there is any settling. Many cases of poor silage can be prevented by proper packing.

## **HOW CAN I PREVENT SPOILAGE?**

Top spoilage in upright silos can be prevented by sealing the top 2 feet with high-moistured weeds, wet hay, or commercial covers. Horizontal silos can be sealed with wet sawdust or ground corn cobs or 2 inches of limestone or soil. Another possibility is a special paper or plastic cover.

Little can be done to prevent top and outside spoilage in temporary or stack silos. However, the larger the stack, the smaller the percentage of spoilage will be. Surface spoilage is not as rapid for grass silage as it is for corn silage.

## **WHAT ABOUT FEEDING?**

Cattle fed grass silage for the first time may need a few days to become used to it. Grass silage has less total nutrients than good heavy corn silage, but it may be much higher in protein—depending on the percentage of legumes and stage of maturity at cutting.

Supplemental grain feeding should be adjusted to the type of silage fed and the type and age of cattle. Beef calves full fed grass silage need 2 to 4 pounds of corn and cob meal, or its equivalent in other grain, to make satisfactory and economical gains. Feed more corn and less high-protein concentrate with legume silage. When shifting from legume to corn silage, increase the protein supplement.

Silage can be fed to all classes of livestock in any quantity available to replace pasture, corn silage, or hay. Roughly 3 to 3½ pounds of grass silage will have feed value equal to 1 pound of hay cut at the same time.

## **PRACTICE SAFETY-FIRST IN YOUR SILOS**

**Silage gives off carbon dioxide when fermenting. It may also give off other gases injurious to men and animals. Being heavier than air, these gases settle down the chute into the feed room or barn. Never go into a silo which has its doors closed. Provide for good ventilation. Keep the blower going for ventilation whenever someone is in the silo.**

## HOW DOES YOUR SILAGE RANK?

Quality of silage depends on the quality of the crop, fermentation, and treatment in storage. Which of these is yours?

**High quality**—dark green with a sharp clean acid smell from desirable grasses and legumes cut at the proper time; moist, not wet to the feel.

**Poor condition**—may have same color and smell as high quality, but composed of weeds or over-mature plants. Can be prevented by cutting desirable grasses and legumes at the proper maturity.

**Carmelized**—light brown to black with a burnt sugar or sweet odor caused by excessive heating due to presence of air. Can be prevented by proper packing at higher moisture content.

**Butyric acid**—light to dark green with a sharp foul stinky smell caused by improper fermentation. Can be prevented by slight wilting, by adding preservatives, or by making sure there is no outside moisture on the silage. Normally found in high-moisture, high legume material.

**Putrid**—stinky, ill-smelling, and putrid, a black slimy mess, caused by excessive moisture and poor packing. Can be prevented by proper packing and good drainage.

**Moldy or musty**—moldy odor, musty, bleached. Caused by dryness and air present. Can be prevented by filling at a high moisture content and proper packing and sealing.

### For Good Silage

- Keep air out by proper packing.
- Don't let forage get too dry.
- Use high-quality legumes and grasses.
- Use preservatives on high-moisture straight legumes or legume-grass mixtures that are put in the silo as soon as they are cut. You may want to use preservatives on all your silage.
- Always seal horizontal silos to prevent outside spoilage.
- Just as with hay, "make grass silage when the sun shines."
- Use sodium metabisulfite on unwilted, wet, green material only.

UNIVERSITY OF MINNESOTA, INSTITUTE OF  
AGRICULTURE, ST. PAUL 1, MINNESOTA

Cooperative Extension Work in Agriculture and Home Economics, University of Minnesota, Agricultural Extension Service and United States Department of Agriculture Co-operating. Skuli Rutford, Director. Published in furtherance of A

UNIVERSITY OF MINNESOTA

June 30, 1914.  
15M-5-56



3 1951 D01 931 456 Q