THE MAKING OF LEGUME AND GRASS SILAGES
IN SILOS AND STACKS

by

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Within comparatively recent years considerable interest has developed in
the making of silages out of legume and grass crops. This interest has come about
largely due to the fact that in the early season weather conditions may be such
that it is impossible to make legume and grass crops into good hay. It is known
that hay that is alternately rained upon and dried by the sun loses a good share
of its feeding value. Rain washes out much of the feed nutrients, especially in
partly dried hay. Thus we find weathered hays lower in protein and minerals, much
decreased in their Vitamin A content, and much more unpalatable to the animal con-
suming them.

Experiments have been conducted at many of the state agricultural experi-
ment stations in this country and at stations in European countries in an attempt
to develop methods whereby legume and grass crops can be satisfactorily ensiled.
Until recent years it had been found that legume crops such as alfalfa put into
the silo made a very strong, unpalatable silage which lost a considerable amount
of its protein content during the ensiling process. This is due to the fact that
the legume crops and immature grasses are very high in protein but low in sugar
content, and as a result bacterial decomposition of the protein occurs before fer-
mentation of the sugars to lactic and acetic acid takes place. This is in contrast
to corn which has a high percentage of carbohydrates in proportion to its protein
content and which makes a palatable silage on fermentation. The acids quickly
formed in corn silage or in legume or grass silage to which molasses has been added
prevent protein decomposition and the result is a palatable silage with very slight
nutrient losses.

Crops That Can Be Ensiled.

Investigations conducted the country over would indicate that good silage
can be made from practically any legume or grass crop. Alfalfa, clover, soybeans,
vetch and oats which are mostly vetch, peas and oats, immature grasses such as
might be obtained in the early season from pasture, mixed legumes and grasses - all
make good ensilage when molasses is added to allow the proper fermentation.

Moisture Content at Time of Ensiling.

Most of the crops that have been ensiled give the best results when they
contain about 70% of water at the time of ensiling. Alfalfa and clover seem to have
about the correct dry matter content in the early bloom stage and grasses and grains
in the pre-bloom stage. Therefore, in putting such material into the silo it is
desirable to do this immediately after cutting. If the crop is allowed to dry out
before ensiling, or if it is too mature when cut, then it is difficult to pack it
down sufficiently to prevent spoilage. If the crop does dry out or is too mature
for one reason or another when cut, then water should be added at the time of ensil-
ing in sufficient amounts to bring the moisture content up to about 70%. Immature
grasses and clovers such as pasture clippings may have as much as 80% of water when
out. If the crop is very immature it should be allowed to wilt for one to two hours
so that the dry matter will increase to about 30%.
Harvesting Methods.

The same farm machinery as that ordinarily used for hay cutting can be used to cut the material to be put into the silo. The green matter is, of course, very heavy and the farm machinery is, in many cases, not built for this heavy work, but with care can be used successfully. In some sections of the country a windrow attachment has been obtained and fastened to the cutter bar of the mower, which rolls the green material into a windrow and saves the operation of windrowing with a side-delivery rake or other rake. It should be borne in mind that the green hay weighs about three times as much as the dry hay, in loading the material onto wagons or trucks. So far as the silo or ensilage cutter is concerned almost any fly-wheel type cutter in reasonably good condition will cut and elevate the green hay crops. It is recommended that the cutter be set to cut the material in one-fourth to one-half inch pieces.

Adding Molasses to the Ensiled Material.

Results at the Oregon Agricultural Experiment Station and at experiment stations in other states would indicate that about eighty pounds of molasses should be added per ton of green alfalfa or clover, or any other crop that is mainly legume, and about sixty pounds of molasses for the cereal or grass crops. It is much better to be on the safe side and add a small excess of molasses than not to add enough. Molasses is a good feed for the dairy cow and it serves the additional purpose of making a palatable feed out of the material ensiled.

As to the best method of adding the molasses to the material, the way that seems to work out simplest for the individual farmer is the best. The molasses may be added on the cutting table, between the rolls and the cutter, in the drum of the cutter, in the pipe immediately above the cutter, or in the distributor pipe. This molasses can be added either diluted or undiluted. If the weather is warm and the molasses will flow it is probably simpler to add it in the undiluted condition. Usually the drum of molasses, or a barrel, is set on a table at some height above the cutter so that it will flow by gravity to the part of the silage cutter where it is to be added to the material being ensiled. Usually a 1½ to 1½ inch pipe should be provided to carry the molasses from the drum to the cutter, with a valve to regulate the flow. If an extra barrel is used and the amount of molasses that should be put on with each load is weighed out, then one can determine fairly easily whether the right amount is being added. After a little experience in filling, the approximate amount can be gauged by the size of the stream of molasses. A stream of molasses about one-half inch in diameter will deliver about 75 pounds to the ton when the cutter table is kept reasonably full. If the weather happens to be somewhat cold the molasses can be diluted with three to four times its weight in water, in order to allow it to run more freely. The valve should, of course, be shut off when the cutter is not running.

Type of Silo.

Practically any type of upright silo can be used for making molasses silage. The main consideration is to have it airtight with well fitting doors. It pays to tramp down the material at the time of ensiling, especially around the walls and, if possible, to seal it at the top. There will be about the same amount of loss at the top of the silo if not sealed as we find in the case of corn silage. If the silo is covered with tar paper, following by some poor quality of forage or sawdust, then there will be practically no loss.
The Stack Method of Making Ensilage.

In case no silo is available then there is the possibility of making ensilage according to the stack method as has been developed on the West Coast by the Western Washington Experiment Station at Puyallup, Washington. This method is fully discussed in the Washington Agricultural Experiment Station Bulletin #348 by R. E. Hodgson and J. C. Knott. The main features of this method of making ensilage are given in the following report by R. E. Hodgson, of the Western Washington Experiment Station:

"The stack method of preserving green forage on the farm has several important advantages. It is a very low-cost method of keeping forage for winter feeding purposes; it permits the harvesting of forages when at the proper stage of maturity regardless of weather conditions; it is an effective way in which to store surplus pasture-growth in early spring, so that it can be fed to the cows during periods of short pasture, or during the winter; it reduces field losses; it can be used to store as silage, forage that has been rained on and partially damaged during the hay-making process, and it effectively supplements the silo and hay-making in areas where it is difficult to make a high quality hay.

"The stack method should find its greatest use on farms where there is insufficient silo capacity, and where a trench silo cannot be used; on small farms where the cost of silo and silo-filling equipment is too great for the size of the enterprise; and on farms where a large acreage of peas is grown. It is easier to make a good quality of silage from grasses and legumes in a silo, and smaller losses of dry matter and nutrients occur. For these reasons the stack method should be used only where silo space cannot be made available.

"A very good quality silage, high in palatability and nutritive value, can be made in stacks provided certain important precautions are observed. The important feature in silage making whether it be in the stack or silo, is to bring about the desirable lactic acid fermentation as rapidly as possible, and at as low a temperature as possible. These principles should be kept in mind when stack silage is being made.

"The most desirable stage at which to harvest grasses and legumes for silage is in the early head or bloom stage. For best results the forage should be stacked when the dry matter is from 30 to 35 percent, or, in the case of alfalfa perhaps 40 percent. Since freshly cut forage with no surface moisture on it averages about 25 percent it is necessary to wilt the forage several hours before stacking. Silage that is made from forage of high moisture content usually is stronger, and somewhat greater losses of dry matter and nutrients occur. If forage is too dry when stacked, excessive heating and mold growth cause high losses in dry matter and nutrient content, and lowered palatability.

"When building a stack, it may be erected on the surface of the ground. If drainage conditions permit, however, a shallow pit in which the stack is built, should be prepared. The dirt from the pit is thrown to one side for use in covering the stack. The stack should be from 12 to 14 feet wide and when completed, about 12 feet high. The length will vary according to the amount of material to be put in. The stack of these dimensions usually contains from one to one and one-half ton of fresh forage per running foot.

"In building a stack the sides should be built as straight as possible, the center being kept level full. When completed, a cover of dirt 12 to 18 inches deep should be put on top as soon as possible. After the stack has been topped
with dirt and it has settled for a day, dirt should be thrown on the sides until the stack is well covered. It is left this way until feeding time which may begin in six to eight weeks.

"The stack should be opened at one end and sections of from two to three feet fed off at one time. The dirt cover should be piled for use the succeeding year. By feeding the silage cut in this way only a small portion of the surface is exposed at any one time.

"Stack silage can be made by either cutting the material, or stacking it long. Better results are obtained from cutting, in that smaller losses occur, but whether this saving in feed more than pays for the added expense of cutting, has not been determined as yet.

"The use of molasses as an aid in preserving grasses and legumes, particularly alfalfa, as silage in silos, has been recommended. The soluble carbohydrates in molasses assist in the preservation process and add to the palatability of the silage. This is particularly the case when legumes such as alfalfa are ensiled, because legumes are comparatively low in nitrogen free extracts in proportion to protein. Molasses can also be used in stacks in the same manner. The molasses is usually added to the green forage as it enters the cutter, at the rate of 50 to 75 pounds per ton of forage. When forage is stacked uncut, perhaps the best way to add the molasses is to dilute it in a small amount of hot water and sprinkle it over the surface of the stack as it is being built.

"If the forage is ensiled at the proper dry matter content, it is problematical whether the added expense of incorporating molasses, will be more than off-set in savings, in the feed value of the ensiled material.

Perhaps the most important steps in building a stack of green forage are: (1) build it high, at least 12 feet; (2) keep the sides straight and the stack level so that it will not tip, and (3) cover the top with 12 to 18 inches of dirt. (Covering the sides appears to be less important, but it does aid in the preservation of the forage.)"