Silage Crops for Dairy Cattle

Circular 463
By W. B. Nevens

University of Illinois • College of Agriculture
Agricultural Experiment Station and Extension
Service in Agriculture and Home Economics
Mechanical Silage Harvester Saves Man Labor

This machine, in one operation, harvests the standing corn, chops it into short lengths, and elevates it into the truck. It thus saves the labor used with the old-style harvester in handling the bundles.

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For directions for feeding silage, see Circular 440, FEEDING THE DAIRY HERD, which will be sent on request.

Urbana, Illinois

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Silage Crops for Dairy Cattle
By W. B. Nevens, Chief in Dairy Cattle Feeding

Silage is a valuable and economical feed for dairy cattle in Illinois. It is so highly palatable that the entire harvested plant preserved as silage is consumed without waste. It aids in keeping the appetites of the cattle keen, has a desirable laxative effect, and produces a general appearance of good health.

In converting the corn crop into silage, a farmer is enabled to utilize about 50 percent more of its feeding value than when he uses only the grain, and also much more than he could by feeding the crop as grain and dry stover, for stock leave much of the dry stover uneaten. Some legume crops also, particularly the first cutting of alfalfa, may be fed with less waste when preserved as silage than when cured and fed as hay, according to recent tests. Furthermore, weathering has little, if any, chance to cause deterioration in the quality of forage harvested for silage, while great losses in feeding value often result when corn stover is allowed to stand in shocks in the field or when forage crops, such as alfalfa, are harvested as hay instead of preserved as silage.

The production and preservation of silage, however, presents many problems, which are discussed in this circular. Recent investigations indicate the answers to some, and practices that have proved successful on dairy farms point the way to the solution of others.

CORN AS A SILAGE CROP

Grain Varieties Superior to Late Varieties

The varieties of corn commonly grown in the southern states usually produce, under central Illinois conditions, large amounts of forage, but the grain, as a rule, does not mature. On the other hand, the varieties of corn commonly grown for grain in central Illinois often yield smaller amounts of green forage than the southern varieties. The question then is, which of these two types of corn is the more valuable for silage purposes.

Some varieties of corn bear more than one ear on a large proportion of the plants. Since the grain is higher than the stalks in feeding value per pound, a question also arises as to the relative values for silage purposes of prolific and single-ear varieties.

To answer these questions grain varieties were compared with late-maturing southern varieties and prolific with nonprolific types, in tests
at the Illinois Experiment Station extending over a five-year period. The performance of the different varieties and hybrids included in these tests is shown in Table 1.

**TABLE 1.—CORN HARVESTED AS SILAGE: YIELDS OF DIFFERENT VARIETIES AND HYBRIDS IN ILLINOIS EXPERIMENTS**

<table>
<thead>
<tr>
<th>Variety or hybrid</th>
<th>Yield per acre as harvested (lbs.)</th>
<th>Yield per acre of dry matter (lbs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Grain varieties, 1923-1927</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boone County White</td>
<td>22 000</td>
<td>7 400</td>
</tr>
<tr>
<td>Democrat</td>
<td>16 000</td>
<td>5 600</td>
</tr>
<tr>
<td>Illinois Two-Ear (prolific)</td>
<td>24 000</td>
<td>7 400</td>
</tr>
<tr>
<td>Leaming</td>
<td>17 000</td>
<td>6 600</td>
</tr>
<tr>
<td>Reid Yellow Dent</td>
<td>20 000</td>
<td>7 100</td>
</tr>
<tr>
<td>Average</td>
<td>20 000</td>
<td>6 880</td>
</tr>
<tr>
<td><strong>Southern varieties, 1923-1927</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ardelt</td>
<td>21 000</td>
<td>6 700</td>
</tr>
<tr>
<td>Cocke Prolific</td>
<td>23 000</td>
<td>6 300</td>
</tr>
<tr>
<td>Garrick Prolific</td>
<td>24 000</td>
<td>5 800</td>
</tr>
<tr>
<td>Mexican June</td>
<td>22 000</td>
<td>5 900</td>
</tr>
<tr>
<td>Virginia Horsetooth</td>
<td>24 000</td>
<td>6 600</td>
</tr>
<tr>
<td>Average</td>
<td>23 000</td>
<td>6 270</td>
</tr>
<tr>
<td><strong>Other tests</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1935)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Station Yellow Dent</td>
<td>23 100</td>
<td>8 070</td>
</tr>
<tr>
<td>16 hybrids, average</td>
<td>23 600</td>
<td>8 530</td>
</tr>
<tr>
<td>Highest yielding hybrid</td>
<td>24 800</td>
<td>10 000</td>
</tr>
<tr>
<td>Lowest yielding hybrid</td>
<td>23 700</td>
<td>7 350</td>
</tr>
<tr>
<td>(1936)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Station Yellow Dent</td>
<td>12 900</td>
<td>4 470</td>
</tr>
<tr>
<td>22 hybrids, average</td>
<td>14 700</td>
<td>5 100</td>
</tr>
<tr>
<td>Highest yielding hybrid</td>
<td>18 700</td>
<td>6 860</td>
</tr>
<tr>
<td>Lowest yielding hybrid</td>
<td>7 900</td>
<td>3 180</td>
</tr>
</tbody>
</table>

**Greater Yield of Dry Matter and Less Tonnage.**—While the average yield of fresh matter from the southern varieties at harvest time was greater by about a ton to the acre than that from the grain varieties, the grain varieties yielded more dry matter to the acre. In other words, about a load more of corn to the acre from the southern varieties was handled without obtaining as great an amount of dry matter as from the grain varieties.

**Less Seasonal Variation in Yield.**—The grain varieties exhibited less variation in yield from year to year than the southern varieties. Therefore, when growing a grain variety to fill a silo of a certain size, not so great allowance in acreage is necessary as when growing a southern variety.

**Grain Forms Larger Proportion of Crop.**—In a season particularly favorable for the development of late-maturing varieties, the ears of
the grain varieties formed between 45 and 50 percent of the crop; whereas the ears of the southern varieties made up only 35 percent of the crop. This indicates a higher feeding value per ton of silage for the grain varieties, for, as already noted, grain is of greater nutritive value per pound than are stalks. In this season the ears of the southern varieties were about two weeks later in appearing than those of the grain varieties. The kernels of the southern varieties were usually in the milk or soft-dough stage when ensiled. This is a disadvantage since silage made at either of these stages has a higher acid content than when the corn is more nearly matured, and consequently it is apt to be less palatable to some kinds of livestock.

More Digestible and Greater Feeding Value.—In digestion trials in which sheep were used, silage from Reid Yellow Dent had higher digestibility than silages from two southern varieties—Virginia Horse-tooth and Cocke Prolific. Sixty-three percent of the total dry matter of Reid was digestible, 60 percent of Virginia, and 55 percent of Cocke.

For milk production the Reid silage proved of considerably more value than Cocke Prolific, but the difference between the Reid and Virginia silages was small. The values for milk production were tested by measuring the production of dairy cows fed well-balanced rations containing larger than the usual amounts of silage.

For putting on weight, Reid silage proved superior to both the Cocke and Virginia silages. This fact was demonstrated by feeding trials in which the three silages were fed in the same quantities (pounds) daily to dry dairy cows and dairy heifers.

Thus the feeding trials with dairy cows confirmed to some extent the findings of the digestion trials with sheep.

A problem in feeding dairy cows capable of producing large amounts of milk is that of providing rations that are comparatively small in bulk yet sufficiently nourishing to sustain high production. For this purpose a silage having high nutritive value per pound is of course more desirable than one of low value. These tests established the superiority of silages from the grain varieties for intensive feeding purposes, because of their higher nutritive content.

Silage More Palatable.—The silage from Reid Yellow Dent contained less acid in proportion to dry matter than the southern varieties. Altho the Cocke silage was unpalatable to some of the sheep in the digestion trials, none of the dairy cattle seemed to dislike it.

Extra Acres Have More Value.—Finally, the grain varieties have the advantage that any acres remaining after the silo or silos have been filled can be harvested for grain.
Hybrids Have Certain Advantages

Hybrid corn has received much attention in recent years. Two seasons' tests (1935, 1936) of hybrids grown for silage at the Illinois Station showed that, taken as a whole, the hybrids possessed three advantages over Station Yellow Dent, namely:

1. They have a slightly greater yield of dry matter to the acre.
2. A greater proportion of the dry matter is contained in the ears, which indicates a higher feeding value per pound of silage.
3. They have greater lodging resistance, and thus the crop is easier to harvest and there are fewer broken and unharvested stalks.

The planting arrangement of the fields used in the trials was two plots of hybrid corn followed by one plot of Station Yellow Dent, a high-yielding strain of Reid Yellow Dent selected and developed by the Illinois Station. A summary of the yields is given in Table 1.

Sweet Corn Makes Good Silage

Sweet corn may be used for silage in the same way as field corn. The forage yield from most varieties is less than that from field corn, altho some of the larger-growing varieties of sweet corn yield well.

Sweet corn harvested when the grain is in the milk stage is likely to produce a sour silage. The dry-matter content of the crop, as outlined on page 10 for field corn, should be used as a guide in deciding upon the time to harvest.

Silage From Corn-Cannery Refuse

Silage from corn-cannery refuse is estimated to be worth from 75 to 90 percent as much as silage made from well-matured field corn. This refuse consists of husks, cobs, and overripe and damaged ears.

In experiments made at this Station the proportion of the dry matter in cannery silage which proved to be digestible was about the same as in normal corn silage, but the feeding value of the silage, as indicated by dry-matter content and quality of nutrients, was about equal only to that of silage from a late-maturing field variety.

Silage from cannery refuse may have such a high acid content as to make it unpalatable to some animals.

Corn Fodder Used as Winter Refill

Sometimes it is economical to refill silos during the winter months with corn fodder (dry plants with ears attached). If careful attention is given to the thorough packing and moistening of the cut fodder in the silo, as pointed out on pages 11 and 12, the silage will keep well.
The feeding value of corn-fodder silage is satisfactory, but is likely to be considerably less per acre than that of corn ensiled at the usual time, for losses thru leaching are likely to occur during the time the fodder remains in shocks in the field.

**Corn-Stover Silage Better Than Stalk Fields**

Corn stover (dry plants without ears) may be ensiled in the same way as corn fodder. The digestibility of corn-stover silage for beef cows has been studied in feeding trials at this Station.\(^1\) The following facts are evident from these studies:

The feeding value of corn-stover silage is practically the same as that of ordinary corn stover. In the digestibility tests the stover silage was found to contain about 85 percent as much total digestible nutrients as whole-corn silage, but the feeding trials indicated that it was only about two-thirds as valuable as whole-corn silage. Compared with pasturing stalk fields or allowing the stover to stand for a considerable time in shocks in the field, the ensiling of the stover is certainly to be preferred, for it reduces the losses from weathering and increases the palatability of the stover and the completeness with which it is eaten.

When the silage is to be fed to dairy cows and dairy young stock, it is doubtful if harvesting the grain separately and using the stover for silage has any advantage over using normal corn silage, for these animals as a rule require grain as well as roughage.

**Ear Corn Too Soft to Crib Saved as Silage**

Ear corn can be preserved as silage provided it is ensiled and packed with due attention to moisture content. Soft (immature) ear corn may be stored in this way for feeding.\(^2\) In tests at this Station\(^3\) fattening cattle relished ear-corn silage and made satisfactory gains on it.

Ear-corn silage is not ordinarily recommended as a feed for dairy cattle because dairy cows are able to utilize large amounts of roughage, and also because the maximum feeding value from the crop can usually be obtained most economically by making silage from the entire harvested crop. However, immature corn too high in moisture to be cribbed successfully may be stored and fed as ear-corn silage.

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Feeding Value Not Affected by Insects

Altho chinch bugs and corn ear worms may greatly injure corn before harvest, the presence of the insects on the corn at the time of filling the silos does not seem to reduce the feeding value of the silage when it is stored under good conditions. The odor and flavor of the acid in the silage make it palatable and seem to conceal any effects of the insects. This is likely to be true of other kinds of silage also.

If there is doubt as to the effect of any given lot of silage on the flavor of milk, it is best to feed it after milking rather than before.

SILAGE CROPS OTHER THAN CORN

Sorghums Are Handled in Same Way as Corn

The sorghums are similar to corn in their adaptability for silage purposes and they may be harvested and ensiled in the same manner as corn. Under central and northern Illinois conditions, the grain of the sorghums may not mature. Silage from immature sorghum is likely to be higher in acid and in water content than normal corn silage. The keeping quality of sorghum silage is therefore likely to be good, but the feeding value of such silage is usually less than of corn silage.

Varieties of sorghums which may be grown for silage purposes in northern Illinois are Dakota Amber and Minnesota Amber, and for central and southern Illinois, Atlas and Orange.

Sunflowers Should Be Cut Early

Fully as much dry matter was obtained from Russian sunflowers, in experiments at this Station, as from corn grown in an adjoining field. Sunflower silage, however, was found to be considerably lower in feeding value per ton than corn silage.

Ensiling sunflowers before more than 20 to 25 percent of the plants are in bloom will usually give the best results, according to these experiments. Altho the content of digestible nutrients increases slightly after this stage, there is no advantage in allowing the plants to mature, since the silage from the early-cut plants is more palatable, more digestible, and gives higher milk yields than silage from later cuttings.

The loss of juice from the silo when sunflower plants are ensiled at the immature stage may be prevented by allowing the plants to wilt in the field after harvesting and before bringing them to the silo.

Alfalfa Crop Sometimes Saved by Ensiling

The common method of preserving alfalfa for winter feeding in Illinois is to harvest, cure, and store it as hay. When there is continued
rainfall during hay making, however, great losses are likely to occur both in the quality and in the amount of hay made from a given area. In such a season the practice of preserving part, or all, of the alfalfa crop as silage has much to commend it, and any necessary additional expense, as compared with haymaking, may be justified if the crop can thereby be saved in first-class condition for feeding.

First-cutting alfalfa is usually difficult to cure as hay on account of weather conditions and the coarseness of the stems. Dairy cows usually refuse these coarse stems in hay, but when preserved as silage this cutting is eaten without waste. On farms where a silo has been emptied during the winter feeding season this cutting of alfalfa may be ensiled for use as a supplement to short pastures later in the season. The silo may then be emptied in time to receive corn as usual in the fall.

That alfalfa ensiled under suitable conditions keeps well and makes a very appetizing feed for dairy cows is indicated by some preliminary experiments conducted at this Station in 1935 and 1936. The early haying stage—that is, when the plant contains not more than 30 to 35 percent of dry matter—appeared to be the best stage at which to harvest for silage, but further tests are needed to confirm this finding. Harvested at this stage alfalfa made good silage even when put up without preservatives, but the keeping quality was improved considerably by the addition of 2 to 3 percent of blackstrap molasses (40 to 60 pounds of feeding molasses per ton of alfalfa) or equivalent amounts of other substances containing sugar.

Mixing the alfalfa with one-third to one-half as much corn harvested at the usual silage stage produced a high-quality silage.

**Common Forage Crops Make Good Silage**

Most of the common forage crops used in feeding dairy cattle can be preserved successfully if ensiled when the moisture content is right and if the packing in the silo is thoroughly done. Clovers, soybeans, peas, and the cereal grains (oats, wheat, and rye) are among these crops. Better results are obtained as a rule when green corn or 40 to 60 pounds of molasses per ton of crop is mixed with the silage. Without the addition of acids or sugar-containing substances such as molasses, an undesirable kind of bacterial action is likely to occur. In this action some of the protein of the silage is decomposed, producing foul odors and making the silage unpalatable.

The stages of development at which these crops should be harvested for silage, according to present information, are as follows:

*The clovers*, middle to late bloom. If sweet clover is allowed to wilt
in the swath for several hours, the juices will not run out of
the silo.
Soybeans, early haying stage, with pods well filled and the seed in
the soft-dough stage.
Cereal grains, milk to dough stages of the seed.

BEST STAGE TO HARVEST CORN FOR SILAGE

Observations of corn ensiled at different stages of development
leads to the belief that corn should be ensiled, as a rule, when it con­
tains approximately 30 percent of dry matter. Corn ensiled at this stage
will be sufficiently mature to make silage of high feeding value per
acet and per ton and will have sufficient moisture content to keep well.

Corn normally does not contain 30 percent of dry matter until sev­
eral weeks after it has attained its maximum fresh weight, which at
Urbana is usually during the latter part of August or the first part of
September. The increase in dry matter during the last few weeks
before the 30-percent content is reached is chiefly in the ears and may
amount to one-third or one-half of the total feeding value of the crop.
If, therefore, the corn is harvested much before its content of dry
matter has reached 30 percent, a large part of the potential feeding
value of the crop will not be realized. If it is harvested after the dry-
matter content is much above 30 percent, it may not keep well.

A 30-percent dry-matter content will not, of course, always assure
the same degree of maturity, since in some seasons the leaves, because
of cool weather and a plentiful moisture supply, keep green until the
grain is well developed, whereas in other seasons they begin to dry up
long before the maturing of the grain. But a 30-percent dry-matter
content will assure as high a degree of maturity as is ordinarily pos­
sible without sacrifice of keeping quality.

Determining Dry-Matter Content.—The dry-matter content of the
standing corn crop can be determined very simply as follows:

By means of a corn knife, harvest 6 to 8 representative stalks of
corn. Split the stalks lengthwise and cut the plants into pieces not
over 1 to 1½ inches long. Mix thoroly and take a sample of 4 to 5
pounds. Weigh to 1/10 pound on a milk or a kitchen scale. Cut and
weigh the sample rapidly and in a shady place to minimize evaporation.

Line shallow baking pans with paper and spread the sample of cut
corn in them. Place in an oven and subject to a temperature that will
dry the corn rapidly without charring the paper. If the oven is
equipped with a regulator, set this at 212° F.
Continue to dry the sample until it loses no more weight. Three or four hours are usually necessary.

Assuming that the sample weighed 4.2 pounds immediately after cutting and 1.3 pounds after drying, the percentage of dry matter would be 31 \( \frac{1.3}{4.2} \times 100 = 31\% \). Such a result indicates that the corn is ready for the silo.

**TWO METHODS OF PUTTING CORN INTO SILOS**

The condition of the corn when it is being ensiled should be the basis for deciding which of two methods to use when putting corn into a silo.

**Method Limited to Corn With High Water Content**

*When corn contains less than 35 percent of dry matter,* it is not necessary to add water during the filling process provided the corn is cut finely and packed closely in the silo.

Corn with a high water content may be blown into the top of the silo without the use of a distributor pipe and without anyone in the silo to level or tramp the corn. The lighter portions of the plant (leaves and husks) tend to fall toward the walls and the heavier portions (stalks and ears) in the center. This, of course, results in an uneven grade of silage, and the drier the corn the more uneven the silage is, for the more complete is the separation of the heavier and lighter parts of the plant.

This method is suitable for corn that has a high water content for such corn usually packs closely, on account of its weight, even along the walls, and the acid produced by the fermentation processes is sufficient to preserve it. (As already indicated, the acid content will be higher in silage from immature corn than from mature corn.)

**Method Suited to Well-Matured Corn**

*When ensiling well-matured corn having more than 35 percent of dry matter,* two to three men are needed for tramping. The corn is best distributed by a flexible distributor pipe moved about constantly so that the corn is spread evenly. Water must be added or spoilage, especially along the walls, is likely to result.

If only one man works in the silo when dry corn is being ensiled, he should stand on a platform or on the silo ladder near the top of the silo and operate the flexible distributor pipe by means of a rope. Trampling of dry corn by only one man may cause uneven settling and consequent spoilage.
When and How to Add Water During Filling

When corn contains more than 35 percent of dry matter at harvest, water should be distributed thru the cut corn during the filling process. The drier the corn, the more difficult it is to cut the husks and stalks finely enough for close packing and the more difficult it is to pack the silage closely even when the cutting has been satisfactorily done. The water helps to soften the dry portions so that they can be packed more closely, thus excluding the air; at the same time it furnishes additional weight, which also aids in packing.

When water is available under pressure, it is ordinarily added to best advantage by allowing it to flow into the flexible distributor pipe of the silo filler. However, one of the men tramping the silage can carry a hose and wet the corn during tramping. If the water is not under pressure, it may be introduced into the blower fan case or into the blower pipe just above the blower. With the two latter methods the water should be shut off before each stopping of the filler.

Adding water after the silo has been filled is not satisfactory because the water tends to seep downward along the walls and does not permeate the silage sufficiently. Some of the nutrients may be carried away if a large amount of water is added in this manner.

When corn is very dry, a large amount of water is required. For example, corn having a dry-matter content of 40 percent needs the addition of 80 gallons (666 pounds) of water to each ton in order to insure good keeping quality. For corn having more than 40 percent dry matter, the amount of water needed is 40 gallons additional for each additional 5 percent of dry matter in the corn.

PREVENTION OF SPOILAGE

Suitable Cover Prevents Surface Spoilage

Unless special preventive measures are used, extensive surface spoilage usually occurs in silos from which silage is not fed for several weeks or more after filling. Decayed and moldy silage equivalent to 8 to 10 tons of good silage has often been removed from silos opened in the spring or summer. This spoilage can be greatly reduced by applying a suitable covering immediately after the silo is filled.

Covering of Roll Roofing.—A very satisfactory method of reducing spoilage is as follows:

Immediately after filling, level the cut corn or other silage crop and tramp it thoroughly. Starting at the side of the silo opposite the exit,
spread strips of a good grade of roll roofing material (single-ply is satisfactory if carefully handled) over the silage, lapping the joints about 4 inches and turning up the ends 4 or 5 inches high against the wall. Apply only one strip of roofing at a time, being careful not to step on it. Then over the roofing spread some dry earth, ground limestone, sawdust, cut straw, or other material that can be spread well and will not injure the silage. Apply at the rate of 12 to 15 pounds to the square foot. Continue placing strips of roofing and covering material until the entire surface is covered. Do not walk on the covering, as to do so may break the roofing material.

Carefully followed, the above procedure makes an air-tight covering except next to the walls, with the result that no spoilage occurs other than in a small section adjoining the walls.

For dry corn it is best to use at least 15 pounds of weight to the square foot, but for very green corn somewhat less weight is required. For various sizes of silos, the following amounts of roofing and covering material are needed:

<table>
<thead>
<tr>
<th>Diameter of silo</th>
<th>Roofing</th>
<th>Covering material</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 feet</td>
<td>1 roll</td>
<td>1,200 pounds</td>
</tr>
<tr>
<td>12 feet</td>
<td>1½ rolls</td>
<td>1,700 pounds</td>
</tr>
<tr>
<td>14 feet</td>
<td>2 rolls</td>
<td>2,300 pounds</td>
</tr>
<tr>
<td>16 feet</td>
<td>2½-3 rolls</td>
<td>3,000 pounds</td>
</tr>
</tbody>
</table>

When opening the silo for feeding, the covering material may be sacked and stored at the top of the silo for use the following season if it is in good condition. Ordinarily the roofing must be renewed each year, since it is usually torn in removal.

Thick Sowing of Oats.—Several other methods of reducing surface spoilage are commonly employed. One of these is to sow oats very thickly after leveling and tramping the silage. The dense network of roots helps to prevent loss of moisture and thus reduces spoilage somewhat. Sometimes wet straw is blown on top of the silage and tramped. Oats may be sown on top of the straw.

Top Layer of Green Corn.—Another method is to grow five or six loads of a large, very late-maturing variety of corn to use as a top layer for the silage. The weight of this green corn aids in keeping the surface silage closely packed and in excluding air. Moreover, the money loss from the spoilage of a ton of this immature corn will not be so great as from the spoilage of a ton of mature corn, since the non-maturing varieties ordinarily produce a greater weight of fresh matter to the acre.

Roofing and Green-Corn Cover.—A simple and effective method of reducing surface spoilage which has been in use at the Illinois Sta-
tion is to level the cut corn when the filling of the silo is nearly com-
pleted; cover the surface carefully with a single-ply roofing as already
described; and then proceed with the filling, spreading 2 to 3 loads of
very green corn over the roofing. When this plan is followed, spoilage
is usually confined to the corn above the layer of roofing.

Moist, Compact Surface.—Any practice that keeps the surface
silage moist and compact, such as occasional watering from a hose and
tramping, also tends to reduce spoilage. On the other hand, conditions
which permit the surface silage to dry out and become loose, such as
insufficient protection of the silage from sun and winds, tend to
increase spoilage.

Rapid spoilage at the surface of a silo as it is being emptied is also
caused by tardy ensiling or poor packing. Dry or poorly packed silage
when uncovered heats quickly, particularly in warm weather.

Mold Thruout Silage Indicates Faulty Packing

Mold is sometimes found distributed thruout the mass of the silage.
Sometimes it is found only in spots but at any depth in the silage. The
cause is the same—too much air, for molds do not grow without air.
Air in the silage sufficient to cause mold indicates that the crop was
very dry and did not pack closely.

A dry crop is more difficult to pack than a green crop, as already
indicated, not only because it is lighter, but because it is much more
difficult to cut finely. Fine cutting is essential to close packing. Spread-
ing, tramping, and wetting are also particularly useful in the close
packing of a dry crop (see pages 11 and 12). The driest part of the
crop should, so far as possible, be put toward the bottom of the silo
in order that the weight of the silage above may help pack it.

Losses Near Doors Caused by Air Leakage

Leakage of air thru and around the doors often causes silage to
spoil. Simple remedies will prevent most of this loss. The doors, if
made of wood, should be made firm and kept in good condition by
thoro nailing and replacement of rotted or broken parts. Narrow
strips of felt should be tacked to all the edges which come into contact
with silo walls and with other doors. Single-ply roofing wide enough
to cover the doors completely and to extend a few inches on each side
should be put in place during the filling of the silo. A convenient
method of doing this is to use roll roofing, thrusting a broom stick
thru the center of the roll and supporting the stick by a rope attached
to the door frame above the level of filling. The roofing may be
unrolled upward as filling progresses.
Mold and Decay at Walls Due to Air Pockets

Molding or decay of silage next to the wall of a silo indicates that the wall is not air-tight or that because of rough walls air pockets from uneven settling of the silage have resulted. If the silo is a wood-stave one, air may enter thru cracks caused by shrinkage of the staves. Simple remedies are tightening of hoops, brushing the walls on the inside with one or more coats of linseed oil, and filling the cracks by brushing in melted paraffin.

If the silo is of tile or brick, air may enter thru very fine cracks caused by shrinking of the mortar joints. A simple treatment is to clean the walls thoroly with a scraper or wire brush and then brush with a special coal-tar preparation. When the weather is not cold, this treatment may be carried out as the silo is being emptied, thus avoiding the trouble and expense of rigid or swinging scaffolds.

Moving Silage From One Silo to Another

Silage that has a strong acid taste and is high in moisture will keep after being moved provided it is packed thoroly. Silage that contains too small an amount of moisture will not be likely to keep when moved.

A silo filler from which the knives have been removed can be used for blowing the silage into the silo.

ESTIMATING THE MONEY VALUE OF SILAGE

A method of estimating the money value of silage is needed in computing feed costs and in settling accounts between landlords and tenants. A convenient method to apply to corn silage is one devised by Pearson and Gaines of the Illinois Station, in which the corn grain in the silage is computed at the market price of corn and the stalk and leaf portion of a ton of silage is figured at the value of other roughage.

Silage Made From Grain Varieties of Corn.—When grown for silage purposes in central Illinois, the ears of grain varieties of corn usually make up 45 to 50 percent of the dry matter of the crop, or about 5 bushels of grain per ton of silage. Investigations in northern Illinois show about 4.6 bushels of grain per ton of silage. The feeding value of the stalk and leaf portion is estimated by Pearson and Gaines to be worth as much as 270 pounds of mixed hay.

The value of the corn grain plus 270 pounds of mixed hay, at current market prices, therefore gives the value of a ton of corn silage.

Silage Made From Crops Other Than Corn.—The value of silage made from crops other than corn may be estimated in terms of the same crop when fed as dry forage.
A sample of alfalfa silage, for example, may be weighed and spread in a pan placed in a warm room where it will reach air-dry condition, that is, lose no more weight at room temperature. The silage should be stirred frequently in order to prevent spoilage.

Suppose the sample as taken from the silo weighed 4.5 pounds and after drying 1.3 pounds. Then \(1.3 \div 4.5 \times 100 = 28.8\), the percentage of air-dry matter in the silage. The feeding value of the silage, therefore, is about 29 percent as much as that of alfalfa hay, and if the hay is valued at $14 a ton, the value of a ton of the silage is $14 \times .29$, or $4.06$.

**MEASURING THE CAPACITIES OF SILOS**

Because of wide differences from year to year in the moisture content of the crop ensiled, it is impossible to state exactly the capacity of a silo in terms of tons. For example, a silo holds many more tons of corn harvested at an immature stage—that is, high in water content—than it does of fully mature corn low in moisture.

To calculate the approximate weight of the silage remaining in a partially emptied silo, first find from the figures in Table 2 the approximate weight of the silage put into the silo. Then find the capacity of the silo for that part which has been emptied and subtract this from the first figure. The difference is an approximation of the amount of silage remaining in the silo. For example, a silo 14 by 44 feet was filled to a height of 36 feet, and 12 feet of silage remains in the silo. The table shows that 102 tons of silage were put into the silo. The part emptied is equivalent to a silo 14 by 24 feet, which has a capacity of 58 tons. The difference between 102 and 58 is 44 tons, the amount of silage remaining.

**Table 2.** CAPACITIES OF SILOS: APPROXIMATE

<table>
<thead>
<tr>
<th>Height of silo in feet</th>
<th>Amount of silage at given silo diameter</th>
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<tbody>
<tr>
<td></td>
<td>10 feet</td>
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<tr>
<td></td>
<td>tons</td>
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<td>16</td>
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<td>52</td>
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</tr>
</tbody>
</table>

\(10,000 = 11.36 \times 10811\)

\(10,000 = 4.37 \times 11864\)