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COSTS OF STORING CORN ON THE FARM

By Lacey F. Rickey
FOREWORD

During the past few years there has been an increasing need for information with regard to the business aspects of farming, including the problems connected with the marketing of farm products.

With the approval of the Purnell Act by Congress in February, 1925, not only was the principle established that it is a proper and legitimate function of an Agricultural Experiment Station to make inquiries and investigations into the social, economic, and distribution fields, but also the Stations of the country had placed at their disposal the means for enlarging their investigations along these lines.

While the Illinois Station has long recognized the economic problems of agriculture, and has issued many publications having to do with them, attention is called to the fact that this bulletin is the first one to be issued under the enlarged program made possible by the Purnell Act.

H. M. Mumford
Dean and Director
COSTS OF STORING CORN
ON THE FARM

By LACEY F. RICKEY, Associate in Grain Marketing Technology

The question of the best time to sell corn intended for market is a question of when the largest net amount may be secured for the corn. A number of factors must be considered before a satisfactory answer to such a question may be found. These are: interest on the money tied up in the corn, interest and depreciation charges on cribs used, insurance against loss from fire and storms, shrinkage, and change in grade.

It is not within the province of this circular to consider price changes that may occur during storage, but rather to discuss the costs which are incurred. With the net result of the items of cost and of profit in mind, the farmer is in a position to consider the condition of the market and to judge whether or not an advance sufficient to offset, or to more than offset, the amount of the net cost may reasonably be expected during the contemplated storage period. He may then determine for himself the best time, under the conditions existing on his own farm, for him to sell corn.

Interest Charge Always a Factor in Holding Corn

If the corn is sold early, interest may be earned on the money obtained from its sale, or indebtedness may be reduced and interest thus saved. In any case the interest charge will be directly proportional to the rate of interest and the length of the storage period, so that the actual charge can be readily computed in each individual case.

With corn at 60 cents a bushel and interest at 6 percent, the charge would be 3.6 cents a bushel a year, or $\frac{3}{10}$ cent a month. Similar monthly charges can be readily determined to correspond with the actual early winter price of corn and the local rate of interest.

Cost of Storage Not Usually Affected by Crib Costs

If the holding of the crop necessitates the building of new storage facilities, the cost of erecting and maintaining the cribs must be considered. In most cases, however, this charge for cost of construction and maintenance should not be added to the cost of storage. Corn is seldom hauled direct from the field to the country elevator or other point of sale, and provision must be made for storage from the time of husking until the corn is ready to shell or is otherwise disposed of. Whether the cribs are in use one month or ten months out of the year makes little or no difference in the cost of maintenance. This charge
becomes, therefore, a general charge against the corn crop rather than against its storage for delayed marketing.

A substantial, permanent crib furnishes the most economical storage for corn. Wire or slat pens and cheap shed cribs are less expensive to construct, but increased losses due to weather and vermin may more than offset this saving. A good substantial crib can be built and maintained at an annual charge of about 3 cents a bushel of capacity. A well-made shed-type crib of 1,000 bushels capacity can be built on this basis. Increasing the size decreases the cost per bushel of capacity, so that a large double crib with overhead bins and complete unloading and elevating equipment can be built and maintained on the basis of an annual charge of 3 cents a bushel when its capacity can be fully utilized.

High Charges Make Terminal Storage Inadvisable

Storage of shelled corn at the terminal markets is seldom practical for farmers. The charges at Chicago are 11/4 cents a bushel for unloading and elevating, and storage for the first ten days. Thereafter the charge is 1/20 of a cent a day, or approximately 11/2 cents a month. The corn is mixed with other corn of the same grade and when delivery is asked for, the same number of pounds of the same grade of corn that went into storage is delivered to the owner. Shrinkage and change in grade therefore do not enter into the problem when corn is stored in public elevators at the terminal markets. High-moisture corn will not be accepted for storage, and in case the grain starts to go out of condition, the elevator has the right to order it removed.

Charges for terminal storage exceed considerably the cost of farm storage, but there is one advantage, that if there is a favorable "bulge" in the market the corn may be sold on a moment's notice. Of course the owner must be in close touch with the market in order to know when such conditions occur.

Insurance Charges About 1/10 Cent a Month a Bushel

The expense of insuring the corn while it is in farm storage should be added to the other items of cost. The risk is there no matter whether it is carried by the owner or turned over to an insurance company; therefore it is correct to add this charge under all conditions. Insurance rates vary considerably according to the type of company writing the policy, the risks insured against, and the general type of the policy. The average charge for protection against fire, lightning, and tornado is about 1/10 of a cent a month for each bushel.

1Information on the construction of cribs may be obtained on request from the Farm Mechanics Department of this Station.
Shrinkage and Change in Grade Important Considerations

The question of the amount of shrinkage which occurs under various conditions is best determined from carefully conducted experiments. The results of extensive shrinkage tests on ear corn made at this Station from 1903 to 1913 are given in Table 1.¹

Losses due to shrinkage vary with the method used in selling the corn, whether on the ear without considering the grade, on the ear according to grade, or on a shelled basis. Since gains or losses due to changes in grade are also affected by the same sets of conditions as those due to shrinkage, the question of change in grade will be considered along with that of shrinkage.

Corn Sold on the Ear, Grade Not Considered

When ear corn is sold simply as "corn" without any specific difference being made in the price for different grades, the sale is usually

¹In 1924 special equipment was set up in order to obtain further information on this question. This equipment consists of eight cribs, each having a capacity of about 300 bushels of ear corn, which are mounted on wheels and run on a short track. At the center of this track is a scale. Each week the cribs are drawn across the scale and weighed. The sides of cribs are boarded up tight when studies are being made on small grains.

Equipment is also provided for blowing either cold or heated air thru the cribs in order to determine practical methods for drying different crops under various conditions. The results thus far secured substantiate the conclusions drawn from the earlier experiments in regard to the rate of shrinkage of ear corn. Data concerning the best methods of handling soft corn, the effect of methods of drying on the germinating power of corn, and the changing relationship between the percentage of moisture in the cobs and in the kernels, are also being secured.
made either by one farmer to another or, in sections where farm corn shellers are not common, by the farmer to other purchasers. A fact to be considered in this type of sale is that the 70 pounds of well-cured ear corn usually accepted as the bushel will actually shell out more than 56 pounds of shelled corn. The overrun will usually be between 3 and 5 percent, and it is customary to consider that this is sufficient at least to pay the cost of shelling.

The question of shrinkage when sales are made in this manner is clearly only one of loss in weight of the ear corn. Of tests made at different experiment stations to determine the amount of this loss in weight, those made at the Illinois Station from 1903 to 1913 seem to have been the most complete. Quoting from Bulletin 183, "Prices and Shrinkage of Farm Grains" (1915): "Each year about 300 bushels of corn were hauled direct from the field and placed in an open crib, protected by tight roof and by slat sides, where it was left until the next crop was gathered. Four times each month the crib and its contents were weighed to determine the shrinkage. The average of the four weighings was taken as the monthly average from which to compute the shrinkage of the corn. In these experiments the months of maximum shrinkage were found to be April, May, and June. After January, there was a gradual increase in the shrinkage rate until May, and from that point on, there was a decided decrease. The corn reached its minimum weight in August."

The corn used, which represented a good average of the crop as it went into farmers' cribs in central Illinois during each particular year, was weighed both into and out of the crib at 70 pounds to the bushel. Corn often is bought during the early winter on the basis of 75 pounds to the bushel, which amounts to taking an allowance of about 6.7 percent for shrinkage. Thus, so far as shrinkage is concerned, approximately the same amount would have been secured by selling in March at 70 pounds a bushel as would have been obtained by selling in November at 75 pounds a bushel.

The methods now employed for determining the percentage of moisture in corn were not in common use at the time of the early experiments reported in Bulletin 183, and no information is available as to the moisture contained in this corn. It will be noticed, however, that there is considerable difference in the shrinkage in various years, undoubtedly due largely to differences in the moisture content of the corn when it was placed in the crib.

It may be safely assumed that in years when corn is well matured and comparatively dry when husked, the shrinkage from November until the following summer will be around 14 or 15 percent. On the other hand, when corn goes into the crib in a rather sappy condition, the shrinkage will amount to 18 or 20 percent or even more.
Instead of using the average, therefore, in applying these results, it is better to select from the table some year for which the figures appear to fit the conditions of the year under consideration. For instance, when corn is cribbed late in the season in a year when it is well matured and has had a good chance to dry in the field, the probable shrinkage is best indicated by that determined for the year 1913 or 1906, when the loss in weight was comparatively small. On the other hand, if conditions have made necessary the cribbing of corn containing considerable moisture, the larger shrinkage given for 1911 or 1903 will more closely indicate the loss in weight to be expected.

In selling corn on this basis, without considering definitely the grade of the grain, any raising of the grade thru storage benefits the seller only in a general way, and no definite value can be assigned to it.

**Corn Sold on the Ear, Grade Considered**

A different set of conditions is encountered when the corn is sold as ear corn but on the basis of grades determined after the corn is shelled. Such conditions obtain where corn is sold on the ear to country elevators to be shelled at the elevator.

The situation here in regard to shrinkage is the same as in the preceding section except that change in grade becomes a factor. Corn sold in the early winter months usually grades No. 4 or lower. In fact, very large amounts of the 1925 and 1926 crops graded No. 6, or sample grade, early in the season merely on account of the large amount of moisture. When properly stored and allowed to dry out, this same corn during the following summer will grade No. 2 or No. 3 because the shrinkage which takes place is accompanied by, and is in fact largely due to, a loss in moisture.

In order to arrive at the true cost of storage for corn sold on the ear by grade, that part of the discount demanded by the market on the lower grades, which may be avoided by holding the corn over, should be deducted from the costs of storing the grain. Avoiding the discount amounts to the same thing as receiving a premium for holding the corn during the time that its grade is being improved.

The discounts taken on the market vary from time to time according to the amount of low-grade corn which is coming forward. A small amount of such lower grading corn can be used to fairly good advantage, but as the proportion grows larger, it is more heavily discriminated against. The discounts can be determined from the current market reports. As a general rule, with cash corn selling at from 70 to 90 cents the discounts will average about 2 cents to a grade, or 1 cent for each additional percentage of moisture contained in the corn. They are more likely to run over this figure than to be less, especially early in the season in years when the crop contains more moisture.
than usual. No. 6 corn may sell 15 cents or more under No. 2, rather than 8 cents under, as indicated above. The only way to figure the discounts at any certain time is to notice the difference in the market price between the different grades of cash corn.

The requirements for the different grades of corn under the standards set up by the U. S. Department of Agriculture are shown in Table 2. All cars of corn going to or thru terminal market points are sampled and graded according to these requirements by licensed inspectors who are under the supervision of the Office of Federal Grain Supervision.

If corn is properly stored, it will dry down to about 13 percent of moisture by early summer. So far as moisture is concerned, this would allow the corn to grade No. 1, but since there is very apt to be enough damage due to mold or other causes, enough foreign material and cracked corn, or a large enough deficiency in weight per bushel to bring the grade down to No. 2 or 3, it is better to expect one of these grades than it is to expect the corn to grade No. 1.

**Corn Sold on a Shelled Basis**

In sections where large amounts of corn are shipped out, a third set of conditions prevails. The grain is stored as ear corn but is shelled on the farm or at the elevator at the time of delivery, and sold on a shelled basis. Under this practice, which is common thruout a large part of Illinois, the farmer is not concerned at all with how much the cobs shrink, since they do not enter into the sale of the corn. His receipts are affected only by that part of the shrinkage which is due to a decrease in weight in the kernels themselves.

The determination of the shrinkage under these conditions is not so simple as it may at first appear. Taking 80 percent of the total shrinkage because the 56 pounds required for a bushel of shelled corn is 80 percent of the 70 pounds required for a bushel on the ear, does not solve the problem. It would if the cobs and the kernels contained the same percentage of moisture, but when corn is cribbed in the fall, the cobs contain a considerably larger percentage of moisture than the kernels. When taken out the following summer, the cobs will usually contain a smaller percentage of moisture than the kernels. A larger proportion of the total shrinkage is therefore due to loss of moisture from the cobs than to loss of moisture from the kernels themselves. Experiments to discover the exact relationship between the amount of moisture in the cobs and that in the kernels under the different conditions of storage are being carried on at this Station.

Altho exact experimental evidence on this point is not now available, the shrinkage of corn which is to be sold on a shelled basis may be estimated with a reasonable degree of accuracy. Since a large part of the shrinkage is due to the loss of moisture, the difference in mois-
ture content when the corn goes into storage in the fall and when it is taken out the following spring or summer is a good index of the amount of shrinkage. When the summer months arrive, corn will have dried down to about 13 percent of moisture on the average, irrespective of whether it contained 18 percent or 30 percent when it was placed in the crib.

Table 2.—Grade Requirements for White, Yellow, and Mixed Shelled Corn
(U. S. Department of Agriculture Standards)

<table>
<thead>
<tr>
<th>Grade No.</th>
<th>Minimum test weight per bushel</th>
<th>Moisture</th>
<th>Foreign material and cracked corn</th>
<th>Damaged corn</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>lbs.</td>
<td>perct.</td>
<td>perct.</td>
<td>perct.</td>
</tr>
<tr>
<td>1.</td>
<td>55</td>
<td>14.0</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>2.</td>
<td>53</td>
<td>15.5</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>3.</td>
<td>51</td>
<td>17.5</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>4.</td>
<td>49</td>
<td>19.5</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>5.</td>
<td>47</td>
<td>21.5</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td>6\footnote{The corn in grades Nos. 1 to 5 inclusive shall be cool and sweet. The corn in grade No. 6 shall be cool but may be musty or sour.}</td>
<td>44</td>
<td>23.0</td>
<td>7</td>
<td>15</td>
</tr>
</tbody>
</table>

Sample grade... White corn, or yellow corn, or mixed corn, respectively, which does not come within the requirements of any of the grades from No. 1 to No. 6 inclusive, or which has any commercially objectionable foreign odor, or is heating, hot, infested with live weevils or other insects injurious to stored grain, or is otherwise of distinctly low quality.

The corn is grades Nos. 1 to 5 inclusive shall be cool and sweet. The corn in grade No. 6 shall be cool but may be musty or sour.

How is the farmer to know the percentage of moisture contained in his corn when it goes into storage?

Most country elevators have equipment for making this test and will gladly do so for their patrons. It is very important that the sample used for determining moisture be representative of the entire lot of corn. In collecting such a sample do not take ears from the top of the crib, but dig down a couple of feet in two or three places and obtain a dozen or more average ears in this way. Shell at once and place the grain in mason jars or other air-tight containers. Thoroly mix this sample before taking the handful used for the test.

A rough approximation of the percentage of moisture can be made by weighing the sample of shelled corn and placing it in pans on a shelf above the kitchen stove or in a warm place near the furnace for several days. Weigh it each day, and when the grain ceases to lose weight you can be assured that it contains not more than 2 or 3 percent of moisture. The original weight divided into the loss in weight will then give approximately the percentage of moisture originally contained in the corn.
Since corn left to dry naturally will usually retain about 13 percent of moisture, even during the hot summer months, and since we have assumed that 2 or 3 percent of moisture remains in the corn when dried in the artificial manner described above, 10 or 11 should be subtracted from the percentage thus determined in order to find what the loss of moisture will be from corn held in the crib.

![Figure 1: Amount of Water Contained in a Bushel of Shelled Corn](image)

This series of 2-gallon bottles shows the maximum amount of water contained in a bushel of corn of the different grades. The foot-rule and 12-quart bucket enable one to visualize the quantities. No. 1 corn may contain up to 15/16 of a gallon of water. Corn which grades "sample" on account of moisture contains more than 1 1/2 gallons of water a bushel. In very soft corn this amount would be as much as 3 gallons.

A loss of say 17 percent of moisture means, however, a loss of more than this percentage in weight, because the base of calculation is changed. Reducing the moisture content from 30 percent to 13 percent actually results in a loss in weight of 19.5 percent.\(^3\)

However, there is still another item of shrinkage. During the period of storage there are chemical changes going on in the corn by which some of the solid matter is converted into water and gases which pass off into the air. A small amount of the volatile oils in the corn is also lost in this way. These losses are not so very large, but considerable experimental work must be done before they can be determined accurately. Adding 10 percent of the amount of shrinkage which has been determined from the change in moisture content will probably be ample to take care of this additional loss.

\(^3\)This may be demonstrated as follows: 100 pounds of corn containing 30 percent (pounds) of moisture will contain 70 pounds of dry matter. By drying this corn until it contains only 13 percent of moisture, the amount of dry matter will not be changed. There will still be 70 pounds of it. This 70 pounds, however, now represents 87 percent (100 minus 13) of the total remaining weight. The total weight of the dried corn is therefore found by dividing 70 by 87 and multiplying by 100, which gives 80.5 pounds. Since it weighed 100 pounds before drying, the shrinkage has been 19.5 pounds, or 19.5 percent.
Table 3.—Shrinkage of Shelled Corn

If enough ear corn to shell out 1,000 bushels is placed in cribs when it contains the percentage of moisture shown in the left column of this table, and is allowed to dry down to a moisture content corresponding to that shown at the tops of the other columns, the number of bushels of shelled corn which will remain is shown in the body of the table.

<table>
<thead>
<tr>
<th>Moisture in corn when cribbed</th>
<th>Grade, if moisture is limiting factor</th>
<th>Amount of shelled corn remaining at end of storage period when moisture content is—</th>
</tr>
</thead>
<tbody>
<tr>
<td>perct.</td>
<td></td>
<td>12%</td>
</tr>
<tr>
<td>32</td>
<td>Sample……….</td>
<td>bu.</td>
</tr>
<tr>
<td>30</td>
<td>Sample……….</td>
<td>750.</td>
</tr>
<tr>
<td>28</td>
<td>Sample……….</td>
<td>775.</td>
</tr>
<tr>
<td>26</td>
<td>Sample……….</td>
<td>799.</td>
</tr>
<tr>
<td>24</td>
<td>Sample……….</td>
<td>825.</td>
</tr>
<tr>
<td>23</td>
<td>6.……….</td>
<td>850.</td>
</tr>
<tr>
<td>21.5</td>
<td>5.……….</td>
<td>862.</td>
</tr>
<tr>
<td>19.5</td>
<td>4.……….</td>
<td>881.</td>
</tr>
</tbody>
</table>

Note 1.—The above results are obtained by dividing the percentage of dry matter in the corn at the beginning of storage (100 minus original percentage of moisture) by the percentage of dry matter remaining at the end of the storage period (100 minus final percentage of moisture) and multiplying by 1,000. The loss thus determined has been arbitrarily increased by one-tenth to cover unaccounted losses.

Note 2.—Corn containing 30 percent or more of moisture would usually be considered “soft.”

When all the above factors are taken into consideration, the total shrinkage will be such as to leave at the end of the storage period the amount of corn indicated in Table 3. In general, the percentage of shrinkage on a shelled basis will range between two-thirds and three-fourths as much as will the percentage of shrinkage for ear corn as given in Table 1.

Figuring Storage Costs

Example 1: When Corn Is Sold on the Ear at 70 Pounds to the Bushel

When corn is sold on the ear, the price increase necessary to offset the costs of carrying the corn for delayed marketing may be determined as follows:

Let us assume that new corn is selling in November for 60 cents a bushel of 70 pounds in a year when the moisture content of corn is fairly high. By referring to Table 1 it is decided that conditions correspond to those of 1903. What price must be obtained the following June to offset the costs incurred? The shrinkage up until June will amount to 17.9 percent, or let us say 18 percent. Subtracting this figure from 100 leaves 82, which divided into the 60 cents obtainable at husking time gives the price which will offset the shrinkage. To this result must be added the cost of interest and insurance, and the
charge for the use of crib if conditions are such that this item should be included.

$$100\% - 18\% = 82\%$$

$$60 \div 82 = .732$$

100 times .732 cents = 73.2 cents

Interest at 6\% for 7 months...... = 2.1 cents

Insurance for 7 months............. = .7 cents

Total............. 76.0 cents

Under these conditions then, 76 cents in June amounts to 60 cents in the preceding November.

**Example 2: When Corn Is Sold on the Ear at 75 Pounds to the Bushel**

If 75 pounds must be given for a bushel in November, however, the increase in price required to offset storage charges need not be so large. Let us figure on the basis of 100 bushels, or 7,000 pounds of ear corn at husking time.

Since 75 pounds are to be given for a bushel, this is equal to only 93\% bushels. If the corn is held over and the shrinkage amounts to 18 percent (see Example 1), 82 bushels of 70 pounds each will be left for sale the following summer. This represents a loss of 11\%/3 bushels as compared with the fall sale, or 12.1 percent on the basis of 93\% bushels. We have then—

$$100\% - 12.1\% = 87.9\%$$

$$60 \div 87.9 = .683$$

100 times .683 cents = .683 cents

Interest at 6\% for 7 months...... = 2.1 cents

Insurance for 7 months............. = .7 cents

Total............. 71.1 cents

**Example 3: When Ear Corn Is Sold According to Grade**

In this case the costs of holding will be the same as for corn which is sold without reference to grade, except that the change in grade which usually occurs during storage will bring a return which offsets part of these costs.

Corn of rather high moisture content may be taken to illustrate this case, corn which would grade No. 6, let us say. If it is sound corn and properly dried out, it should grade No. 2 the following summer. This change in grade can be depended upon to increase the price 8 cents or more, bringing it up at least to 68 cents. In order then for the June price for this corn to be 76 cents or 71 cents as determined in Examples 1 and 2 respectively, it will be necessary for the general corn market to rise only 8 cents if 70 pounds are given for a bushel in November or 3 cents if 75 pounds must be given. The 8 cents which comes from the bettering of the grade makes up the rest of the difference between November and June prices.
Example 4: When Corn Is Sold on the Shelled Basis

When corn is shelled before being sold, the moisture content must first be determined as nearly as possible. By mid-summer the corn will usually have dried down to about 13 percent moisture. If the weather is very dry, it may go down to 12 or even 11 percent under Illinois conditions. The number of bushels of shelled corn for every 1,000 bushels cribbed which will be left after the moisture content has been reduced during storage is given in Table 3.

Corn containing 24 percent of moisture, or just enough to force it down to sample grade, will be taken as an example. If 1,000 bushels of this corn are dried down to 13 percent moisture, 861 bushels will be left, according to Table 3. We may assume that the local quotation for corn is 60 cents in November. This price is nearly always based on No. 4 corn, which is the lowest grade deliverable on future contracts.

The market discount for sample grade, under the price for No. 4, will be at least 6 cents and may run up to as much as 15 cents. Under normal winter market conditions this corn, containing 24 percent moisture, would have to take a discount of about 8 cents, which means a net price of 52 cents. The 1,000 bushels would then sell for $520. In order to receive the same amount for the 861 bushels which the corn will weigh out after it shrinks, the price must be 60.4 cents. Interest and insurance charges should be added.

\[
\frac{520.00}{861} = 60.4 \text{ cents}
\]

\[
\text{Interest at } 6\% \text{ for 7 months} = 2.1 \text{ cents}
\]

\[
\text{Insurance for 7 months} = .7 \text{ cents}
\]

\[
\text{Total} = 63.2 \text{ cents}
\]

The price of 60 cents offered in the winter was based on No. 4 corn. By summer this corn should grade No. 2 or No. 3 and hence bring from 2 to 5 cents more than No. 4 corn. If No. 4 corn is still quoted at 60 cents, No. 3 should sell for about 62 cents and No. 2 for about 64 or 65 cents. It appears then that the price will be high enough, with no change in the market, to offset the cost of carrying this corn.

Or let it be assumed that the corn is very good in the fall; that it contains only 19.5 percent of moisture and grades therefore No. 4. When 1,000 bushels of this corn dries down to 13 percent moisture, 918 bushels will remain. Using the same prices as above, $600 would be received for this corn in November, and to obtain as large a total

\[\text{In January, 1927, members of the Chicago Board of Trade voted to amend their rules so that only Nos. 1, 2, and 3 corn should be deliverable on future contracts after the current season. Hereafter it is probable that quotations will be made on the basis of No. 3 corn.}\]
the following summer, a price of 65.4 cents a bushel would be necessary. But this good corn should then grade No. 2 or possibly No. 1, and again the premium over No. 4 corn, on which our price was based, would about make up this difference. Any increase in the market will turn a profit to the owner of the corn. The shrinkage bugaboo all but disappears when considered in this light.

Damage in the Cribs May Force Corn Into the Lower Grades

Other factors which must be considered in deciding how long corn should be stored include loss from rats, fluctuations in the cost or convenience of shelling and hauling the corn, and the possibility of damage to the corn while in the cribs. In a good substantial crib with concrete floors the loss from rats and other pests will be very small. If poorer construction is used, this loss will become large enough to demand attention and should be allowed for in deciding the question of holding corn. Fortunately the Illinois farmer need not expect that insect pests will cause any extensive damage to corn in the crib.

The cost of shelling and hauling the corn also has a seasonal aspect. If these operations should be allowed to interfere with field work during the summer, the actual cost would be unreasonably high. The extent to which this must be considered will be determined by conditions on the individual farm. Condition of the country roads also must often be taken into account in deciding when the corn is to be hauled.

Probably the most important of these additional factors is the possibility of damage to the corn while in the cribs. It must be remembered that high moisture is not the only condition that forces corn into the lower grades. If the corn becomes moldy or damaged in any other way to an appreciable extent during storage, this fact will hold it in the lower grades even tho the moisture content has been reduced. In this case the shrinkage loss is incurred with no offsetting advantage thru bettering the grade. The data in Table 2 show how grades are affected by these conditions.

In holding corn, then, one must be sure that it will remain cool and sweet during storage, or the actual costs will be raised considerably. It is important, therefore, in constructing corn cribs to take full advantage of the possibilities of natural ventilation. When soft corn is stored, it is usually advisable to provide additional ventilating devices to assist in the abundant and thoro natural circulation of air. Information on the construction and auxiliary ventilation of corn cribs may be obtained on request from the Farm Mechanics Department of this Station.
SUMMARY

The items of cost and of profit in storing corn, outside of the chances for change in the corn price level, include interest on the money tied up in the corn, interest and depreciation charges on cribs used, insurance against loss from fire and storms, shrinkage, and change in grade. The last two items are by far the most important.

Since corn may contain anywhere from 18 to 30 percent or more of moisture when cribbed, depending on the maturity of the crop and on weather conditions, it is inadvisable to figure shrinkage on the basis of averages. Well-matured ear corn, gathered late in the season, may be expected to shrink about 13 percent from the time it is cribbed until the following summer. Corn which is not so well matured and hence contains more moisture, but is still good enough to keep well under proper storage conditions, may be expected to shrink as much as 20 to 21 percent during the same period. Corn which is very "soft" or immature will of course shrink even more.

The problem of shrinkage when corn is sold on a shelled basis is entirely different from that when it is sold on the ear. The cobs shrink more in weight than the kernels, so that the proportion of loss of weight is less for the kernels than for the entire ear. Therefore, if only the weight of the shelled grain enters into the sale, the larger proportional item of shrinkage is eliminated. For this reason, when corn is sold on a shelled basis, the shrinkage to be allowed for is reduced to between two-thirds and three-fourths as much as for ear corn.

Because the moisture content of ear corn is lowered during storage, the grade will usually be raised. This constitutes a factor of profit in that the discount on the lower grade is avoided. The additional return is often enough to offset nearly all or even all of the costs of storage.

It must be remembered, however, that if corn goes "out of condition," or is otherwise materially damaged during storage, the grade will not be raised and may even be lowered. If the grade is not raised, the corn will be subjected to a discount, and if the grade is actually lowered, there will even be an additional loss.
The eight cribs are mounted on wheels, which run on a short track having a scale in the center. Cribs 1 to 4 are equipped for artificial drying, cribs 5 to 8 depend on natural ventilation, and 9 is the scale house, containing also a furnace and blower for forcing heated air thru the cribs. Shed 10 is a blower used to force unheated air in a similar manner. This is the plant referred to in the footnote on page 5.