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Selecting and preparing seed corn

P. G. Holden
Iowa State College

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SELECTING AND PREPARING SEED CORN

DEPARTMENT OF AGRONOMY.

By P. G. Holden.

The condition of seed corn throughout Iowa this year is such as to cause the gravest apprehension. Personal examinations of corn in every section of the state have been made and the Station is now making extensive tests of samples sent in for germination.

There seems to be a general impression that, since the corn apparently dried out well last fall, there will be no danger of having poor seed. The fact is that there has seldom been so large a percentage of the corn which was killed. Frequently one ear will be good and the very next one poor; one side of the ear may be alive and the other one dead and, of two neighboring kernels on the same ear, one will grow and the other will not.

This peculiar condition is probably due principally to three causes. First, the season was slow and the corn did not mature properly and, as a consequence, there was an unusually large amount of moisture left in the corn. The shrinkage experiments, which have been carried on by the Station, show that the corn contained an average of about thirty-six per cent. of water at the beginning of the cribbing season. Second, the dry weather during October dried the corn off and it appeared to be dry when in reality it was not. Many were so confident that the corn was dry and would keep, that no pains were taken to store it in a dry place. Third, the unusually cold weather during the latter part of November and first of December either killed the germ or weakened it greatly, except where the seed was protected or where unusual pains had been taken to dry it out thoroughly.

Seed corn that was stored in a dry place, such as the attic,
before the 20th of October, is in good condition except in some cases where the corn moulded or grew, or both, from the lack of ventilation.

When we consider that more than nine million acres, considerably over one-fourth of the entire area of the state, is planted to corn each season, and that it requires more than 1,300,000 bushels of seed to plant this area and when we realize that the character of the seed, its vitality, breeding, purity, adaptability to the soil and climate and uniformity in both size and shape of the kernels all exercise a great influence on the future yield, the great importance of paying the closest attention to the corn for seed purposes cannot be over-estimated.

CONDITION OF SEED CORN

Last winter and spring more than 3300 samples of seed corn were sent to the Experiment Station at Ames to be tested. These samples came from every section of the state and were made up in each case of 200 kernels taken from 100 ears, thus giving a representative of each man's seed. These samples were given a careful germination test.

This large number of tests shows that an average of nineteen per cent. was entirely dead and that an additional twenty-one per cent. was low in vitality and unfit to plant, leaving only sixty per cent. of good seed. It is also apparent that many of the kernels which give a fair germination are weakened and, in the event of a cold spring, would either refuse to grow or give weak plants.

The following is a page taken from the records of germination of samples received for testing. It is an average of all the samples and shows the wide variation between samples from different persons. Sample No. 783 is entirely worthless for planting, while all of Nos. 791-792 gave a strong vigorous germination.

The headings of the tables have the following meanings:

Strong—The kernels gave a strong, vigorous germination and appeared as if they would make strong productive stalks.

Weak—The kernels germinated but were not vigorous and, if the season were unfavorable, they might not grow at all; but, if they did, the stalks would be weak, perhaps produce only nubbins.

Worthless—Did not germinate.
A "poor stand" of corn is responsible more than anything else, for the low average yield in the central west. The ground may be rich, the preparation good, and the corn receive the best of cultivation, but if the stand is poor the yield will be correspondingly poor.

Careful counts of the number of stalks per hill were made last year in more than a thousand different corn fields and it would be safe to say that there were not to exceed sixty-six per cent. of a perfect stand on an average and in some cases it fell as low as forty per cent. This means that the state devoted nearly 9,000,000 acres to corn, and produced only a 6,000,000 acre crop, or, to put it in another way, with a perfect stand the present average yield of thirty-two bushels would be increased to fifty bushels per acre or an increase to the state of 153,000,000 bushels. This does not take into consideration the increased yield made possible through the use of improved varieties, better bred seed, elimination of barren stalks by means of breeding, better methods of cultivation, etc.

The real seriousness of the situation will be more apparent from the following counts illustrating the stand in the poorer,

<table>
<thead>
<tr>
<th>SAMPLE NO.</th>
<th>STRONG</th>
<th>WEAK</th>
<th>WORTHLESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>781</td>
<td>92</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>782</td>
<td>8</td>
<td>40</td>
<td>52</td>
</tr>
<tr>
<td>783</td>
<td>0</td>
<td>20</td>
<td>80</td>
</tr>
<tr>
<td>784</td>
<td>56</td>
<td>28</td>
<td>16</td>
</tr>
<tr>
<td>785</td>
<td>80</td>
<td>16</td>
<td>4</td>
</tr>
<tr>
<td>786</td>
<td>85</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td>787</td>
<td>72</td>
<td>12</td>
<td>16</td>
</tr>
<tr>
<td>788</td>
<td>52</td>
<td>40</td>
<td>8</td>
</tr>
<tr>
<td>789</td>
<td>52</td>
<td>28</td>
<td>20</td>
</tr>
<tr>
<td>790</td>
<td>52</td>
<td>32</td>
<td>16</td>
</tr>
<tr>
<td>791</td>
<td>52</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>792</td>
<td>100</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>793</td>
<td>24</td>
<td>16</td>
<td>60</td>
</tr>
<tr>
<td>794</td>
<td>64</td>
<td>24</td>
<td>12</td>
</tr>
<tr>
<td>795</td>
<td>60</td>
<td>24</td>
<td>16</td>
</tr>
<tr>
<td>796</td>
<td>63</td>
<td>24</td>
<td>16</td>
</tr>
<tr>
<td>797</td>
<td>60</td>
<td>36</td>
<td>4</td>
</tr>
<tr>
<td>798</td>
<td>28</td>
<td>40</td>
<td>32</td>
</tr>
<tr>
<td>799</td>
<td>64</td>
<td>20</td>
<td>16</td>
</tr>
<tr>
<td>800</td>
<td>60</td>
<td>20</td>
<td>20</td>
</tr>
</tbody>
</table>

**Average** | 58.2  | 21.8 | 20

(For an illustration of these classes see Figure 4, p. 186).
medium, and better fields of Iowa. The following figures illustrate the number of stalks per hill in the poorer fields: 2 2 2 0 3 2 0 1 3 0 1 1 1 3 1 0 2 3 0 1 2 1 0 0 2 1 3. Each of the first three hills had two stalks, the fourth hill was missing and the next had three stalks, etc.

That the results might be as accurate as possible, counts similar to the above were made in three places in each field. The hills were taken just as they came in the row and generally crosswise of the way the corn was planted. The field above represents only fifty-two per cent. of a stand of corn. Twenty-five per cent. of the hills were missing. Thirty-five per cent. had one stalk, twenty-five per cent. had two stalks and twenty per cent. had three stalks per hill. If the poor stand was largely due to seed of low vitality, which is generally true in case of very poor stands, then the same influence which killed a portion of the seed must also have greatly weakened that which did grow and, as a consequence, the yield is even much less than what is represented by the stand.

The above represents what is found in hundreds of corn fields everywhere in Iowa. Many fields were found in which the stand was as low as forty per cent. The following will illustrate very closely the average stand in the state: 2 3 1 2 1 0 1 1 3 3 1 3 1 2 2 3 0 3 1 2 0 2 1 2. On the average soil of the state this would represent about sixty-five per cent. of a stand of corn. Twelve per cent. of the hills were missing, twenty-eight per cent. of the hills had one stalk, thirty-two per cent. of the hills had two stalks, and twenty-eight per cent. of the hills had three stalks. The following represents the stand in some of the very best fields in the state: 3 4 3 2 1 3 3 3 3 2 3 3 3 2 3 3 3 3 3 3 3 3 3. In this field, there were no hills missing; four hills had one stalk, twelve had two stalks, seventy-six had three stalks, and eight hills had four stalks.

This represents not less than ninety-five to ninety-six per cent. of a perfect stand.

If we go into our fields at husking time and make a study of the stand of corn, we will be convinced of the serious losses to ourselves and to the state each year from a poor stand of corn.

VARIETY TEST OF CORN

Last spring, the Agricultural Department secured seed from more than ninety different sources. The corn was all collected
from farmers living within a radius of ten miles from Ames. In order to secure samples of corn actually planted, the farmers were visited and the corn taken either directly from the planter boxes in the field or from the sacks from which the seed corn was being planted.

The samples were planted by hand, three kernels per hill, and the experiment was repeated three times and treated alike in every respect, throughout the season.

The following table gives the yield per acre of the six highest yielding samples and also of the six lowest yielding samples:

<table>
<thead>
<tr>
<th>Six Highest Yielding Samples</th>
<th>Bushel per Acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample No. 59</td>
<td>80.5</td>
</tr>
<tr>
<td>Sample No. 58</td>
<td>80.0</td>
</tr>
<tr>
<td>Sample No. 66</td>
<td>78.5</td>
</tr>
<tr>
<td>Sample No. 71</td>
<td>77.0</td>
</tr>
<tr>
<td>Sample No. 138</td>
<td>75.0</td>
</tr>
<tr>
<td>Sample No. 68</td>
<td>75.0</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td><strong>77.5</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Six Lowest Yielding Samples</th>
<th>Bushel per Acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample No. 44</td>
<td>31.5</td>
</tr>
<tr>
<td>Sample No. 132</td>
<td>33.5</td>
</tr>
<tr>
<td>Sample No. 86</td>
<td>34.5</td>
</tr>
<tr>
<td>Sample No. 92</td>
<td>36.6</td>
</tr>
<tr>
<td>Sample No. 29</td>
<td>37.5</td>
</tr>
<tr>
<td>Sample No. 83</td>
<td>40.0</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td><strong>35.6</strong></td>
</tr>
</tbody>
</table>

Note particularly the wide range in yield from 80.5 bushels per acre to 31.5 bushels or a difference of 49 bushels. The average yield of the six highest samples was 77.5 bushels, while the average of the six lowest yielding samples was 35.6 bushels, or a difference of 41.9 bushels per acre.

This great difference in yield was due largely to the difference in vitality of the seed, as in every case the low yielding samples had given a poor stand. It strongly emphasizes the great importance of knowing that the seed to be planted will give a good, strong, vigorous germination.

**Testing Each Ear of Corn**

There is, perhaps, no one thing which will do so much to increase the yield of corn on every farm as the testing of each ear to be used for seed. This should be done before the rush of spring work begins or it is likely to be neglected.
The importance of discarding ears that refuse to grow or show a weak germination is apparent when we realize that one ear will plant one-fourteenth to one-sixteenth of an acre.

The most practical way for testing the germination of each ear is by using a germination box. This is a simple affair and can be made by any one in an hour’s time. Any box about six inches deep and 2x3 feet in size may be used. Fill the box about half full of moist sand, dirt, or saw dust, well pressed down, so that it will leave a smooth, even surface. In case saw dust is used it should be put in a gunny sack and set in a tub of warm water for half an hour so that it will be thoroughly moistened before using. Take a white cloth about the size of the box, rule it off, checker-board fashion, one and a half inches each way. Number the checks 1, 2, 3, and so on and place it over the saw dust and tack to the box at the corners and edges. Lay out the ears to be tested, side by side on the floor; remove one kernel from near the butt, middle and tip of the ear; turn the ear over and remove three kernels from the opposite side, in like manner, making six kernels in all, thus securing a sample from the entire ear. Place the six kernels at the end of the ear from which they were taken. Use care that the kernels do not get mixed with the kernels from the ear next to it. After the kernels are removed, boards may be laid over the rows of corn to keep them in place until the germination is known. (See Figure 3). Place the kernels from ear of corn No. 1 in square No. 1 of the germination box; from ear No. 2 in square No. 2, and so on with all of the ears. Then place over this a cloth considerably larger than the box; cover with about two inches of moist sand, dirt or saw dust and keep in a warm place where it will not freeze. The sitting-room will perhaps be the most suitable place. The kernels will germinate in four to six days. Then remove the cover carefully to avoid misplacing the kernels in the squares, (a piece of thin cloth placed over the kernels before the covering is put on, will prevent the kernels from sticking to the upper cover). Examine the kernels in the germinating box; for example, the kernels in squares No. 1, 11 and 20 (see Figure 3), have failed to grow and some of the kernels in squares 2, 3, 4, 9, 12, and 15 have refused to grow or show weak germination. The corresponding ears should be rejected. The ears showing weak germination should be treated the same as worthless ears.
Fig. 1

TAking SIX KERNELS FROM EACH EAR
AND PLACING THEM OPPOSITE THE EAR FROM WHICH THEY WERE TAKEN

Fig. 2
The kernels are placed on the floor opposite the ear from which they were taken. Before removing the kernels from the ears, it is a good plan to drive two nails at each end of the rows of corn to hold the ears in place.

Fig. 3
GERMINATION BOX

Figure 2, putting the kernels in the germination box; placing those from ear No. 1 in block No. 1; from ear No. 2 in block No. 2, etc.

The germination box is filled about half full of thoroughly moistened saw dust. A cloth ruled off into blocks or squares is then placed on the saw dust and fastened at the corners and edges by tacks to hold it in place.

To prevent the ears from being disturbed while the test is being made, it is a good plan to place a heavy board or plank over each of the rows of ears.

RECORD OF INDIVIDUAL EARS

Maximum yields can be obtained only by using the best seeds of the best varieties. These seeds can be secured only by care-
ful selection and breeding. Last spring the most perfect ker-
nels from 102 of our best ears of corn were planted in rows side
by side, each row being planted with kernels from a single ear.
At husking time each row was harvested by itself and the record
of yield, barren stalks, broken stalks, suckers, etc., of each indi-
vidual ear was thus secured.

The following table shows the wide variation in the results
obtained from the different ears:

<table>
<thead>
<tr>
<th>Ear No.</th>
<th>Bushels per Acre</th>
<th>Percent of Stand</th>
<th>Number Broken Stalks</th>
<th>Number Barren Stalks</th>
<th>Number of Suckers</th>
</tr>
</thead>
<tbody>
<tr>
<td>75</td>
<td>90.56</td>
<td>96.5%</td>
<td>258</td>
<td>79</td>
<td>106</td>
</tr>
<tr>
<td>93</td>
<td>36.06</td>
<td>43%</td>
<td>41</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>77</td>
<td>83</td>
<td>48%</td>
<td>6</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>73</td>
<td>83</td>
<td>48%</td>
<td>6</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>54</td>
<td>75</td>
<td>25%</td>
<td>106</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>85</td>
<td>75</td>
<td>25%</td>
<td>106</td>
<td>6</td>
<td>0</td>
</tr>
</tbody>
</table>

This record illustrates very clearly the great difference in
the producing powers of different ears. Some ears produced
more than six times as many broken stalks as others. Other
ears seemed to be predisposed to barrenness. For example, ear
No. 19 gave 79 barren stalks while ear 83 gave only 6. The
variation in the number of suckers was still more striking, ear
37 giving 106 suckers while ear 75 was entirely free.

Ears 47 and 83 (47 is not given in this table), are also very
interesting by way of comparison. The rows planted from these
two ears had practically the same number of stalks. Ear 47
produced 55 bushels per acre. It had 67 barren stalks, 244
broken stalks and 62 suckers. Ear 83 yielded 76 bushels, had
only 6 barren stalks, 130 broken stalks and 5 suckers. The figures
illustrate clearly the wide range in two ears, not only in produc-
ing power, but also in their tendencies to reproduce inherited
qualities.

The following diagram shows the yield in bushels per acre
of the ten highest yielding rows in our breeding plats. The five
lowest yielding rows and the average of the entire one hundred
and two breeding rows are also shown:
Record of Individual Ears

<table>
<thead>
<tr>
<th>Rows</th>
<th>Yielded bushels per acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>75</td>
<td>90.58</td>
</tr>
<tr>
<td>72</td>
<td>87.49</td>
</tr>
<tr>
<td>84</td>
<td>87.20</td>
</tr>
<tr>
<td>92</td>
<td>84.11</td>
</tr>
<tr>
<td>77</td>
<td>83.03</td>
</tr>
<tr>
<td>25</td>
<td>82.43</td>
</tr>
<tr>
<td>70</td>
<td>81.14</td>
</tr>
<tr>
<td>64</td>
<td>80.66</td>
</tr>
<tr>
<td>21</td>
<td>80.36</td>
</tr>
<tr>
<td>96</td>
<td>80.23</td>
</tr>
</tbody>
</table>

Five Lowest Yielding Varieties

<table>
<thead>
<tr>
<th>Varieties</th>
<th>Yielded bushels per acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>93</td>
<td>36.06</td>
</tr>
<tr>
<td>73</td>
<td>36.27</td>
</tr>
<tr>
<td>86</td>
<td>42.31</td>
</tr>
<tr>
<td>74</td>
<td>42.38</td>
</tr>
<tr>
<td>80</td>
<td>43.24</td>
</tr>
</tbody>
</table>

The average of the ten highest yielding rows was 83.71 bushels per acre; the average of the five poorest yielding rows was 40.05 bushels per acre. The 102 rows grown yielded on an average 67.09 bushels.

Breeding Plats

While it is not advisable to grow a large acreage of any new or untried variety, the farmer should find out what variety is best suited to his conditions. This can be learned only by growing small plats of the most promising varieties. When the most suitable variety has been secured pure seed should be obtained and the best ears planted on one side of the field. It is preferable to have this breeding plat on the south or west side of the field, that the prevailing winds may not carry pollen from the rest of the field on to the breeding plat.

If corn of another variety should be within a quarter of a mile of the breeding plat, the varieties are liable to become mixed. In such a case the breeding plat should be located as far from the other varieties as possible, or if no other protected place is to be had, the selected ears may be planted in the central part of the field. When very little seed corn can be had it may be planted in a block in one corner of the field, for if planted in long narrow strips the pollination is sure to be poor.

This method of planting the choicest ears on one side of the field is an easy and practical way of securing good corn for the following year. It should be planted early enough to insure
its ripening. The weak and barren stalks could easily be de-
tasseled so that only the most vigorous pollen would fertilize the 
silos. Even if the land received no special cultivation and if 
the crop received no extra care the grower would know where 
to secure his best seed ears and would be more likely to harvest 
them at the proper time than he would if he were depending on 
the occasional good ears obtained during the husking of his en-
tire crop.

CORN PLANTER TESTS

The samples of corn used in these experiments were butted 
and tipped Iowa Silver Mine, butted and tipped Boone County 
White and hand selected Mixed White. Five hundred hills were 
dropped through each planter.

Three kernels in a hill was considered perfect.

Number of Times the Following Kernels Were Dropped per Hill

<table>
<thead>
<tr>
<th>Experiment No. 1</th>
<th>Planter</th>
<th>1k</th>
<th>2k</th>
<th>3k</th>
<th>4k</th>
<th>5k</th>
<th>6k</th>
<th>% Perfect</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. 1</td>
<td>1</td>
<td>15</td>
<td>469</td>
<td>15</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>93.3%</td>
</tr>
<tr>
<td>No. 2</td>
<td>2</td>
<td>35</td>
<td>457</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>91.3%</td>
</tr>
<tr>
<td>No. 3</td>
<td>2</td>
<td>25</td>
<td>445</td>
<td>27</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>89%</td>
</tr>
<tr>
<td>No. 4</td>
<td>4</td>
<td>51</td>
<td>414</td>
<td>30</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>82.4%</td>
</tr>
<tr>
<td>No. 5</td>
<td>1</td>
<td>65</td>
<td>337</td>
<td>94</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>76.5%</td>
</tr>
<tr>
<td>No. 6</td>
<td>3</td>
<td>137</td>
<td>305</td>
<td>53</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>61%</td>
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<table>
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<th>Experiment No. 2</th>
<th>Planter</th>
<th>1k</th>
<th>2k</th>
<th>3k</th>
<th>4k</th>
<th>5k</th>
<th>6k</th>
<th>% Perfect</th>
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<td>12</td>
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<td>0</td>
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<td>111</td>
<td>332</td>
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<table>
<thead>
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<th>2k</th>
<th>3k</th>
<th>4k</th>
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<td>198</td>
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<td>0</td>
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Nos. 1, 2, 3 and 4 show results with different makes of edge 
drop planters, while 5 and 6 show results with planters using 
the common round hole plater plates.
The experiments covering the years 1898-9, 1899-0, 1900-1, were weighed into a crib containing about 100 bushels; the crib was set upon scales and weighed each week during the year. For the years 1902-3, 1903-4 and 1904-5, a crib containing about 100 bushels was built and set upon a wagon and kept under cover,—as nearly usual crib conditions as possible. The wagon was drawn over the scales regularly once each week. A second scale was used frequently, to eliminate possible errors.

Different types of corn, representing average conditions, were used.

Shrinkage of corn by years and months given in percentage:

Shrinkage of Corn by Years and Months Given in Percentage

<table>
<thead>
<tr>
<th>Date</th>
<th>1898-9</th>
<th>1899-0</th>
<th>1900-1</th>
<th>1901-2</th>
<th>1902-3</th>
<th>1903-4</th>
<th>1904-5</th>
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<tr>
<td>Nov</td>
<td>8.1</td>
<td>4.0</td>
<td>2.6</td>
<td>1.8</td>
<td>8.2</td>
<td>8.3</td>
<td></td>
</tr>
<tr>
<td>Dec</td>
<td>8.9</td>
<td>6.0</td>
<td>3.5</td>
<td>3.6</td>
<td>9.0</td>
<td>9.5</td>
<td></td>
</tr>
<tr>
<td>Jan</td>
<td>9.0</td>
<td>2.3</td>
<td>4.6</td>
<td>5.7</td>
<td>11.7</td>
<td>10.2</td>
<td></td>
</tr>
<tr>
<td>Feb</td>
<td>10.1</td>
<td>2.7</td>
<td>5.9</td>
<td>6.0</td>
<td>12.6</td>
<td>10.5</td>
<td></td>
</tr>
<tr>
<td>March</td>
<td>10.3</td>
<td>4.4</td>
<td>6.8</td>
<td>9.2</td>
<td>14.9</td>
<td>15.3</td>
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<td>14.6</td>
<td>6.6</td>
<td>8.6</td>
<td>15.3</td>
<td>19.3</td>
<td>15.4</td>
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<tr>
<td>May</td>
<td>15.0</td>
<td>7.4</td>
<td>11.4</td>
<td>15.1</td>
<td>24.3</td>
<td>19.0</td>
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</tr>
<tr>
<td>June</td>
<td>16.0</td>
<td>8.0</td>
<td>12.4</td>
<td>21.4</td>
<td>26.0</td>
<td>19.8</td>
<td></td>
</tr>
<tr>
<td>July</td>
<td>17.7</td>
<td>7.4</td>
<td>15.9</td>
<td>22.5</td>
<td>26.7</td>
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<tr>
<td>Aug</td>
<td>18.0</td>
<td>7.1</td>
<td>15.0</td>
<td>22.6</td>
<td>29.5</td>
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<tr>
<td>Sept</td>
<td>19.9</td>
<td>7.6</td>
<td>14.0</td>
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<td>30.5</td>
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<tr>
<td>Oct</td>
<td>19.7</td>
<td>7.9</td>
<td>13.6</td>
<td>24.9</td>
<td>30.0</td>
<td>20.8</td>
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Table Showing Different Rates of Shrinkage

<table>
<thead>
<tr>
<th>Variety</th>
<th>Reid's from field</th>
<th>Reid's from shock</th>
<th>Mortgage Lifter</th>
<th>Winnie's Fav.</th>
<th>Nashes' Early Yellow</th>
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</thead>
<tbody>
<tr>
<td>October</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Nov. 7</td>
<td>2.13</td>
<td>4.46</td>
<td>3.30</td>
<td>3.20</td>
<td>2.47</td>
</tr>
<tr>
<td>Nov. 14</td>
<td>5.32</td>
<td>6.00</td>
<td>5.28</td>
<td>6.84</td>
<td>3.46</td>
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<tr>
<td>Nov. 21</td>
<td>7.71</td>
<td>7.10</td>
<td>6.69</td>
<td>8.22</td>
<td>5.44</td>
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<tr>
<td>Nov. 28</td>
<td>10.68</td>
<td>8.93</td>
<td>10.57</td>
<td>10.50</td>
<td>5.44</td>
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<tr>
<td>Jan. 9</td>
<td>15.76</td>
<td>11.94</td>
<td>17.49</td>
<td>15.30</td>
<td>7.67</td>
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</table>

Table shows the high percentage of moisture contained in much of the corn at cribbing time. Nashes' Early Yellow was perfectly matured and as a result lost very little in shrinkage.
The various samples of Reid's harvested under different conditions all contained a very great amount of water.

Table showing shrinkage by months in four leading varieties of ear corn from time it was husked and cribbed in the fall of 1902 for nine successive months.

<table>
<thead>
<tr>
<th></th>
<th>Mammoth Red</th>
<th>Keegley's Golden</th>
<th>Iowa Silver Mine</th>
<th>Yellow Farm</th>
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<tbody>
<tr>
<td>Per cent shrink in pounds</td>
<td>Per cent shrink in</td>
<td>Per cent shrink in</td>
<td>Per cent shrink in</td>
<td></td>
</tr>
<tr>
<td>October 25</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
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<td>7.60</td>
<td>6.66</td>
<td>6.54</td>
<td>7.36</td>
</tr>
<tr>
<td>December 25</td>
<td>9.12</td>
<td>7.71</td>
<td>8.00</td>
<td>8.52</td>
</tr>
<tr>
<td>January 25</td>
<td>11.40</td>
<td>9.82</td>
<td>9.80</td>
<td>10.85</td>
</tr>
<tr>
<td>February 25</td>
<td>12.92</td>
<td>11.57</td>
<td>12.00</td>
<td>12.79</td>
</tr>
<tr>
<td>March 25</td>
<td>14.82</td>
<td>13.33</td>
<td>13.45</td>
<td>14.72</td>
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<tr>
<td>April 25</td>
<td>20.58</td>
<td>18.90</td>
<td>18.90</td>
<td>19.37</td>
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<td>May 25</td>
<td>20.58</td>
<td>18.59</td>
<td>19.27</td>
<td>19.75</td>
</tr>
<tr>
<td>June 25</td>
<td>22.05</td>
<td>20.35</td>
<td>20.00</td>
<td>21.31</td>
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<tr>
<td>July 25</td>
<td>22.05</td>
<td>21.40</td>
<td>21.09</td>
<td>21.70</td>
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PREPARING SEED CORN FOR THE PLANTER.

After the germination test, the next step is preparing the corn for the planter. First, by removing the mixed kernels. In yellow varieties it can be done better before shelling and in white varieties after shelling, as the mixed kernels often do not show in white corn until the corn has been shelled; second, by butting and tipping the ears of corn to insure the planter dropping the correct number of kernels in each hill.

To be certain of getting the drop adjusted properly, twenty or thirty ears should be shelled separately and put into grades of large, medium and small kernels. The planter can then be tried with each grade and the proper plates selected for each grade. If the proper plates are not at hand, then those nearest may be calibrated to do the work as desired. This is very essential and it should be done before the rush of spring work begins. A small outlay for additional plates or a new planter may mean the difference between a good crop and a poor one. The planter must do the work properly. After the planter is tested and it is known what grades are wanted, the seed corn should be carefully shelled, put into sacks and properly labeled.
The planter can be adjusted to drop the different grades in a uniform manner if the grades are kept separate and the proper planter plate used for each grade, but if these different sized kernels are mixed and dropped miscellaneously it will be impossible to secure a uniform number of stalks per hill.

We cannot afford to neglect this important work. If every farmer in the state would test every ear of his seed corn this winter in the way described above the yield would be wonderfully increased. No other time will be so profitable to the farmer as that spent in testing the vitality of his seed and in grading it to ensure the planter dropping the proper number of kernels in each hill. It is possible for every one to do this work. It will cost nothing but the time, of which there is plenty at this season when the work should be done. Every farmer should realize the importance of testing every ear of his seed corn before spring work begins. No possible loss can come from it and it will insure a good stand of corn which is absolutely essential, if the best results are to be secured from the year’s hard work. One day spent in March on the seed corn, may be worth more than a month of hard work in the field, later Without good seed, the after labor is of little avail. Nothing is more depressing or discouraging than a poor stand of corn. If the seed is carefully tested and only good seed planted there are no risks to run, except those made necessary to every one from the conditions of the weather, etc., which cannot be controlled. It is during the bad seasons, when conditions are unfavorable that we most need the kernels with large deep germs of a bright cheerful color well-matured, and likely to give the most vigorous germination.

It is essential to seek improved varieties of corn, but it is also important that better treatment be given to the seed that is to be planted.

DO NOT IMPORT SEED CORN.

If the test shows the seed to be weak and unreliable and it is necessary to secure other seed it should be obtained from some reliable neighbor who has a surplus.

No farmer can afford to depend upon imported seed for the main part of his crop. If he is unable to secure a variety from his neighbors that has been grown and that has matured well in his locality and it becomes necessary to import seed, it should be secured from the shortest distance possible, east or west, as such seed is preferable to that grown in the north or
south, but it is safer to import it from the north than from the south. The southern varieties will produce large stalks and heavy foliage, and the large deep-kerneled ears will be late in maturing. Northern grown corn will be smaller in ear and finer in stalk, but will mature earlier. Seed corn imported from a distance and especially from a southern latitude, seldom gives satisfactory results the first two or three years, even though the seed be of the best, which oftentimes is not the case.

It is well known that most of the seed corn put on the market by seedsmen is bought of farmers in crib lots, shelled, screened and sacked ready for sale, little or no attention being paid to the selection. In fact it is generally handled with a scoop shovel and is known as the “scoop shovel method of selection.”

The chances are that the farmer has in his own crib better corn than that which he purchases from seedsmen at four or five times the market prices. And then he runs the risk of it not maturing in his locality.

If it were simply a matter of losing the price of the bushel of imported seed corn, it would not be so serious, but when we consider that a bushel of seed corn ought to produce four hundred bushels of corn, worth from one hundred and thirty to one hundred and sixty dollars, the serious nature of the question is very apparent.

SELECTING AND STORING SEED CORN.

One of the best plans is to begin this spring by selecting fifty or one hundred of the very best ears in your seed corn, while you are making the test of germination. These ears should then be butted and tipped and each ear shelled by itself and carefully studied. The kernels should have a bright, cheerful appearance, be full and plump at the tips and have a large clear germ, otherwise they should be discarded. It is very important that this choice seed should be planted at the time of the first planting, putting it on the south or west side of the field, unless there is danger that it would become mixed from some neighbor’s corn nearby. In this case, it may be put on the other side of the field. The important thing is to get it in early and, if possible, on fall plowed ground. This will allow the corn to become thoroughly matured early next fall. The great importance of this cannot be over-estimated. It is the late maturing corn that is caught by the freezes, as there is not sufficient time for it to dry out.

All the seed corn for the next crop should be selected from this patch which was planted from the very best ears. It is a very common practice to select the occasional good ears found
throughout the entire husking season. There are three important reasons why this should not be done. In the first place, we are more likely to neglect the work until too late, when we find ourselves without good seed for the next year. Again, we often begin harvesting from the poorest portions of our fields first for early feeding, as this corn is more likely to be soft and will not crib well. It should also be remembered that the occasional good ears which are harvested throughout the entire husking season have necessarily been fertilized to a greater or less extent by pollen from the scrub stalks and those which are perhaps barren. In other words, we have simply selected a good female, but know nothing of the character of the male stalks from which the pollen came that fertilized the kernels. On the other hand, if our seed is all selected from the seed patch planted only from the very best ears, we are much more certain of good parents on both sides. It is a good practice and one followed by many corn growers to go through this seed patch of three or four acres planted from this fifty or sixty best ears of corn, after it has been "laid by" and before the tassels appear, and to cut out all the weak and sickly stalks and those that are too tall and late or too short and early and in this way prevent them from producing pollen to fertilize the kernels of other ears.

One of the most serious results from depending on the occasional good ear found throughout the entire husking season is that many of the fields are late and the corn immature and the husks will prevent the corn from drying out properly and, as a consequence, it is frozen before it is husked or, at least, before it has had time to dry out after husking. Again, we often begin harvesting out poorest fields first and delay saving seed until we come to our "best fields."

If every ear of corn that is to be used for seed in Iowa next year could be harvested this fall not later than October 10th, and hung up where it will dry out thoroughly before the bitter cold freezes of November it would add millions of dollars to the wealth of Iowa.

Let us go into the best and earliest planted fields, and select well matured ears from the most vigorous stalks, strip off their husks and hang in the attic at once where the circulation of air is good and protection is had from the cold freezing weather of November and December. On the 228,000 Iowa farms an average of about 40 acres is devoted to the growing of corn, and while six bushels of good seed is sufficient to plant this, let us abundantly provide ourselves and save two or three times this amount, as some pests may call upon us to replant, or our neighbor may be needing some seed. Remember, it takes only about a dozen ears to plant an acre. Each ear should have special care.
The above cut illustrates one of the best and safest methods of storing seed corn. Ten or twelve ears are tied in a string and hung on some wires supported by other wires from the rafters.

The 21 strings of seed corn shown in the cut require a space less than six feet long by twenty inches wide, and yet this amount of seed will plant more than fifteen acres.

The advantages of this method of storing are, first: that it gives better protection from mice than where it is spread on the floor or corded in piles or put in racks. Second, it gives better circulation of air which allows the corn to dry out quickly and thoroughly, thus protecting it from moulding and sprouting and from being frozen while it is sappy. The greatest enemy to good seed corn is hard freezing while it still contains moisture, consequently there is more danger from late harvesting than from too early harvesting. However, it is not a good plan to harvest the seed in September while the corn is immature, as it is more difficult to preserve, and will be chaffy and give weaker plants than corn which has been allowed to fully mature on the stalk.

**PLACE FOR STORING SEED.**

Taking all things into consideration probably there is no better place to store seed corn than in the attic. In the nearly 5,000
samples of seed corn sent to the college for testing during the past two years, those preserved in the attic generally gave the strongest germination and also the highest percentage. The experiments conducted at the college, where seed was stored in over 40 different ways, also show that the attic is one of the very best places for seed corn. The second best place seems to be the cellar and especially the furnace room. There are several objections to the average cellar. It is apt to be too damp and the corn must be well dried before being placed in the cellar and it must not be corded up or put in piles but hung up.

There is more danger from mice and generally there is less room, but it has one great advantage in that it protects the corn from the hard freezes. Seed that is hung in the barn or under an open shed generally comes through the winter in fair condition provided it was harvested and hung up during the early part of October, yet the experience of the last two years shows that much of the seed stored in this way was either killed or greatly weakened. During the warm damp spells the seed gathered moisture and was injured by the cold freezes that followed.

It is quite generally supposed that if the seed sprouts in the spring it is all right. As a matter of fact, much of it has often been so weakened that it will not grow, especially if the ground is cold or the seed is planted too deep, or if it does grow it gives only weak stalks “fooling around all summer doing nothing.”

Bad seed has cost Iowa this year not less than 60 or 70 million bushels of corn. This is placing it at a very low estimate. Few people realize how great is this loss to the state each year.

We cannot afford to be careless with our seed corn. It means too much. Poor seed means a poor stand; not only is a portion of our field idle, but we must cultivate the missing hills and the one stalk hills and the poor worthless stalks, and we receive nothing in return. Thousands of people this year in Iowa worked more than a third of every day on ground that produced nothing. Do not depend for seed on the occasional good ear. The corn will be injured by freezing before it is husked, or before it has had time to become dry after husking.

Do not store seed corn in barrels or boxes. It will gather moisture, as we say, and mould or freeze. Do not store over the laundry nor over the stable. Do not put immature or freshly gathered seed corn in a warm room on the floor or in piles. It will either sprout or mould or both. It should be hung up at once, and the windows opened to allow the freest circulation of air.

Do not depend on the crib for seed corn.
The importance of selecting fifty or sixty of the choicest ears and planting them on one side of our earliest planted field cannot be too strongly emphasized. Out of this seed patch the seed for next year's crop should be selected not later than October 20th, and hung up at once where it can dry out thoroughly before any severe freeze.

Let us have a time and a definite plan for harvesting and storing our seed corn. One day devoted to the seed corn at the proper time may be worth more to us than an entire month of hard work next summer put on to a poor stand of corn.

No. 1 shows worthless kernels that refused to grow under favorable conditions. On an average nineteen out of every hundred kernels of all the samples sent in for germination test, up to March 6, are of this class, and should be discarded.

No. 2 shows weak kernels, which, if put into the ground under favorable conditions, when it is cold and wet, will probably fail to grow at all or give weak stalks. Twenty-one kernels in every one hundred gave weak germination.

No. 3 shows strong, vigorous germination, of the two thousand samples sent in, only sixty kernels in every hundred, on an average, showed similar vigor in germination.

These sixty strong kernels, if planted alone on a given area, would doubtless produce more corn than if planted along with the twenty-one weak ones; for the weak ones, producing a weak growth, would use up the light and the air and fertility, which would otherwise go to the advantage of the stronger stalks.

Another objection is the fact that the strong ears would be more or less fertilized by the pollen from the undesirable stalks.
The above cut shows good and bad forms of kernels. The pairs of kernels Nos. 1, 2, 11 and 12 show the best forms in order named; while Nos. 5, 6, 7 and 8 show the poorest forms in the order named. Pair No. 1 is the best since the kernels are full and plump at the tips next to the cob and have large germs. Both of these points are important as they indicate strong vitality and feeding value. On the other hand pairs Nos. 5, 6 and 7 are especially weak with low feeding value and small per cent. of corn to cob.

It will also be observed that these kernels are far from uniform in size and shape (compare Nos. 4, 2 and 6) and hence no planter will drop an even number per hill. (See table of tests.) When we realize that all these kernels were taken from ears that appeared to be good, when examined from the standpoint of the ear alone, we can readily appreciate the importance of paying more attention to the study of the kernels of corn in our seed ears.
Fig. 7

DIFFERENT SIZES OF KERNELS.

No. 1 is an ear of medium quality with deep, fairly uniform kernels. No. 2 has broad, thick, shallow kernels lacking in uniformity, while ear No. 3 is a good example of the long, narrow
shoepeg type. It would be impossible to so adjust the planter as to drop these different styles of kernels together and secure a good stand. See Fig. 6. As the kernels from No. 3 are less than half the size of those from No. 2 they would be dropped much more rapidly if an average sized plate were used. Ear 3 has 980 kernels; ear 2, 540; ear 1, 840. If kernels of this type are to be planted they must be shelled separately and suitable planter plates used for each.

Fig. 8

GOOD SHAPES OF EARS.

Fig. 8 illustrates good forms of ears. These ears are well-proportioned. Their butts and tips are good. The rows are straight and the kernels uniform. The ears are full in the middle parts, showing strength, constitution, and good breeding. It
is very essential that an ear show fullness in the middle portion, as this is the place where the greatest quantity as well as the best quality of corn will be found. Ears 1 and 2 would plant well together. Ears 3 and 1 are slightly better in shape than 2 and 4.

![Poor Ears](image)

**Fig. 9**

POOR EARS.

No. 1 is a fairly well shaped ear, has been well fertilized and will give a good proportion of corn to cob. Its utter lack of uniformity of kernels, however, makes it a very undesirable ear.
for seed. Note the irregularity of the rows, the variation in the size, shape and dent of kernels. Such an ear should never be used for seed.

No. 2 was an early ear but some of its silks were fertilized by pollen from a late variety. Those fertilized by the early pollen produced well matured kernels; those fertilized by the late pollen failed to ripen. A close study of these kernels shows that some of them have lost the entire crown while others have simply burst the skin and exposed the starchy portion. These damaged kernels, being later than the others, were badly crowded and not being so far advanced as their neighbors were forced to grow too long in proportion to their width. The early kernels, having dented, make the late ones appear longer than they really are. The probable reason why these late kernels split open is that being soft and higher than the more matured ones, the pressure of the husks upon the silks held them in such close contact with the crown that the outer covering was weakened and finally burst. As soon as this ear was stored the kernels moulded and in a short time rotted. For further discussion of the disadvantages of kernels maturing at different times see Fig. 11.

No. 3 shows a spiral arrangement of rows with thick blocky kernels, lacking in uniformity. The tip is weak and the whole ear, through lack of proper proportion indicates weakness and lack of breeding.

No. 4 is especially worthy of notice because of the unusual condition of its kernels. The ear is of good length, showing that the stalk which bore it possessed good constitution. Its kernels, however, are very uneven, weak and low in vitality. It is probable that this ear was late and expended a great deal of energy in throwing out silks in hope that they would be fertilized. As it was late and nearly all the pollen had been shed, the only supply left was that which had lodged on the leaves. This, through age, had become weakened and when blown upon the already partly exhausted silks failed to produce kernels of sufficient vitality to properly fill out and mature.
Late corn has usually more nubbins than that which matures earlier. These “scrub” ears are sometimes produced because the silks at the butt of the ear appear so early that there is no pollen to fertilize them. As a result, no kernels are formed on the butt of the ear. No. 4 is a good example of this. No. 3 suffered from the same cause but, in addition, lacked strength and vitality and so produced very few kernels. No. 2 with its wide space between rows is a good illustration of a run out ear. While No. 5 appears to be a medium ear it is, in reality, very poor. Note the peculiarly beaked appearance of the crown of the kernels ending in a needle-like projection. This is a sure indication
of running out. The shallow kernels and the small circumference in proportion to length are strong indications of lack of constitution.

Ear No. 4 has sharp projecting points also. Barring the butt it is a much stronger ear.

The presence of these nubbins greatly reduces the annual yield of corn. Through extreme earliness, or extreme lateness, or owing to lack of vitality, they never produce good ears. They receive the same care and cultivation as the good ears and in return yield very little. By carefully selecting only vigorous seed ears we can greatly reduce this loss. In connection with this, study "The product of a Single Hill," Fig. 15.

Nos. 5 and 2 illustrate ears of corn with good kernels of medium depth. Ears Nos. 1 and 3 illustrate very shallow kernels, and if the kernels from these four ears are mixed it is impossible to plant them evenly.

Ear No. 4 shows space between the kernels at the cob which indicates weak vitality, low percentage of corn to cob and low feeding value, the valuable portion of the kernel not being filled
out. When examined externally these ears all appeared equally good. This shows the importance of removing several kernels when selecting seed corn.

The kernels on ear No. 1 are nearly the same depth from tip to butt; while the kernels on ear No. 2 grow rapidly shorter towards the tip. The kernels on ear No. 3 are small, shallow and flinty, little larger than grains of pop-corn and will run through the planter almost like wheat. When these three ears were shelled together and tested in the planter there was a range of all the way from 2 to 7 kernels per hill.
SHAPE OF KERNELS.

No. 2 shows about the proper space to be looked for between the rows, the two middle ones being a little too open for the upper half of the distance. Should the rows fit more closely it would be a disadvantage as the corn would require too long a time to
dry out. An ear having very little space between the rows at the
crown almost invariably has a great deal of space between the
kernels next to the cob though having narrow pointed kernels.
No. 1 shows more space between the rows than No. 2 and the
kernels will have less space between them next to the cob. The
character of these kernels, however, makes space on No. 1 more
admissable than on ear 2, for the reason that the kernels are of a
rougher type, are much longer and consequently require more
space in order to dry out. The space between the rows at the
butt is, however, too great. Ear 3 shows very wide space and a
broad, thick but shallow kernel. Ears having such wide space
are not necessarily lacking in vitality. It does, however, indicate
a running out such as is most frequently seen in corn grown in
the extreme north of the corn belt. As the season is short the
kernels must take the shallower form with open space in order to
mature. No. 2 illustrates a kernel of medium depth and about
proper space between the rows. It would be best adapted for
the central part of the corn belt while No. 1, with its deep kernels
and wider space between the rows, would be suited for a longer
season such as would be found farther south.

These are all good ears and the tendency would be in select­
ing seed to keep all three of them. This is a mistake. In the
first place these kernels differ too much in size and shape, and
if the ears were shelled the difference would be still more striking.
See Fig. 6. No planter can drop these kernels properly if mixed,
consequently we have a poor stand and low yield no matter how
rich the soil or how favorable the year may be. If it is necessary
to use ears of this kind, separate them into three or more classes
and use the proper planter plate for each.

In the second place it is a mistake to plant these three types
of ears together because they will not shed their pollen nor mature
at the same time. For effects of this see Fig. 9. If you are so
far north that only ear No. 3 will mature, you cannot afford to
risk Nos. 1 and 2; if far enough south to be sure that No. 1 will
mature you are better off without Nos. 2 and 3. The chief
reason why Iowa's corn grades so low on the market is because
we too often grow the large, deep-kerneled southern varieties
which seldom mature here. If we would raise our standard, each corn grower must select only those varieties which mature in his locality. He cannot hope to obtain anything like maximum crops if he attempts to grow such widely varying types as the above illustration shows.

Ear No. 1 shows a moderately long kernel on an average sized cob. The kernel has a good full germ with sufficient space between the rows to dry out readily. The proportion of corn to cob is good.

No. 2 is an illustration of a deep long-kerneled corn on a small cob. Such a corn would naturally be adapted only to the southern districts. Its germ, while longer, is not so full or strong as that of No. 1. A kernel so long and thin is always difficult to plant because the ordinary planter is made for the average kernel and not for exceptionally long ones and, therefore, special care will need to be taken to properly adjust the plates so as to drop the desired number of kernels. Kernels of this formation are inclined to be chaffy and late in maturing. The proportion of corn to cob is rather too great. A small cob is desirable but if it is carried to the extreme it becomes a source of weakness rather than of strength. We can no more reasonably hope to produce an abnormally high percentage of corn to such a cob than to produce large ears on weak, sickly stalks. There is a proper relation or proportion existing between the weight of corn and the weight of cob and if we develop the corn at the expense
of the cob, weakness and loss of constitution will result. While the proportion of corn to cob varies with different varieties it would appear that 86-87 per cent is about the right proportion to give best results.

No. 3 is a more normal ear and shows better relations between corn and cob. The kernels are of medium length and good shape and possess strong, vigorous germs. The crown is not rough, which, taken with the medium depth kernel, would indicate that it was a medium early corn, such as would be suitable for the central districts of the corn belt.
No. 4 shows very short kernels with poor weak germs. This ear would yield a very low percentage of corn to cob.

**PRODUCT OF A SINGLE HILL.**

Fig. 15 illustrates what is too often seen in a single hill—a good ear, a poor ear and a nubbin. We have seen this so often that we never stop to think what it means. Why do not all these stalks bear ears like No. 3? Being in the same hill, the conditions of soil, climate and moisture must have been exactly the same. One could not have received more thorough cultivation than another. From the time the corn was dropped there was no good reason why Nos. 1 and 2 should not be as good as No. 3. Why, then, is there this wide variation? Can we do anything to bring Nos. 1 and 2 up to the standard set by No. 3? We can. The difference in yield of these three ears was not due to differences in soil, climate or cultivation. The difference lay behind all this—it lay in the character of the parents planted. If we could locate all the stalks in the field which spring from the brothers of the kernel that produced No. 2 we would find that the great majority of them were ears, on an average, as good as it is. The same thing would hold true in the case of the parents of No. 1 and No. 3. This would lead us to the conclusion that the difference in these three ears is due to the difference in the producing power of their parents.

In our study of individual ears we saw the wide variation in the yield which different ears produced. We saw that while one ear yielded 90 bushels per acre, another ear beside it, under exactly the same conditions, produced only 36 bushels. Some ears produced twelve times as many barren stalks as others and the same held true with the broken stalks. Now if we can select the ear which gives the large ear-producing stalks and leave out the one which produces the small ear, the one which produces the nubbins, we will have gone a long way toward materially increasing our yield; for it is evident that this wide variation is due to the difference in the producing power of these two ears. In this work of selection the ear may be taken as the unit. While there is something in the individuality of each kernel, we are sure of getting good corn and a large increase in the number of good ears to the hill if we study our seed ears carefully and plant only the best. Fourteen ears on an average will plant an acre, therefore, if we put in one ear that produces a great many nubbins and barren stalks we greatly reduce our yield on that acre.
Out of the five stalks in these two hills only one produced a good ear. Note how weak and sickly the non-productive stalks are compared with the productive one. Barrenness is one of the greatest sources of loss in corn growing. To the farmer who grows corn for the grain alone these barren stalks are worse than a complete loss. They not only deprive the productive stalks of food, moisture and light, but they produce pollen which fertilizes
the silks of the good stalks and so reduces the vigor and future producing power of many of the good ears. Nubbins are simply a mild form of barrenness.

This subject of barren stalks is very closely related to that of "The Product of a Single Hill." (See Fig. 15).

This cut gives an illustration of the class of stalks which produce the nubbins, or what is worse, nothing at all. The unproductive stalks in these two hills have hundreds of brothers scattered here and there throughout the field wherever the kernels from the ear that produced them were planted. Some of these brothers of course bore something, but a large per cent of the plants that came from that ear would be about like four of those in this cut—worse than nothing. On the other hand the stalks bearing the good ear would have hundreds of brothers throughout the field, which came from the same good ear as itself, bearing—not nubbins or nothing at all as these others are doing—but strong, vigorous stalks producing in turn, a large percentage of good vigorous ears.

This question resolves itself into one of getting rid of these unprofitable ears and of planting only vigorous ear-producing seed. On an average one stalk in every seven produces nothing because of barrenness. One acre in every seven planted to corn is worse than wasted because of these unproductive stalks. Yet a little time and care in selecting our seed corn—not a dollar in outlay is required—will materially lessen this enormous loss. We cannot pay too much attention to the careful selection of our seed corn.
Fig. 17 illustrates lack of uniformity in height of ears in the same hill. In all cases these stalks were vigorous and produced ears of average size. It is an undesirable character, however, as it indicates a lack of breeding. As extremely high ears tend to be later than those lower down, they should not be used for seed purposes. Ears, on the other hand, that are too low tend
to extreme earliness and as these two classes do not mature well together they should be avoided and none but ears borne at a uniform height should be used for seed.

Fig. 18 shows two hills of corn. No. 1 has two stalks each of which has produced a good ear. Both stalks are strong and vigorous and the ears are of uniform height. Hill 2, produced
three stalks each of which bore an ear at a uniform and desirable height. This is an evidence of good breeding. Uniformity in height of ear is not so important as uniformity of kernels, but it is important in that it indicates good breeding and in ears of the same variety, a uniform time of ripening.

In selecting seed corn, it is important that all the ears be as nearly as possible of the same type. Ears Nos. 3 and 4 should not be planted with Nos. 1 and 2 as they are fifteen days later in maturing than the latter. In order to secure the best pollination it is important that all the stalks should shoot and the ears silk at about the same time. The very early and the very late stalks are usually barren, or partly so, owing to lack of pollen at these
times. It is also very difficult to secure an even stand of different types, as kernels are almost certain to be of different sizes and shapes, making it impossible for a planter to drop them evenly.

Fig. 20 illustrates good forms of ears. All are well proportioned, have good butts and tips, the rows are straight and the kernels uniform. All the ears show strength, constitution and good breeding. Ears 1, 3 and 4, would plant well together. Ears 3 and 1 are slightly better in shape than ears 2 and 4.

When we realize the possibilities that are wrapped up in a
single ear of corn and then make the careful selection that the importance of the subject demands we can, in a few years, greatly increase the value of the corn crop.

Fig. 21

Ear with Broken Kernels.

Fig. 21 illustrates a condition that exists more frequently than is generally supposed. Externally this ear appeared perfectly sound and in good condition. When some of the kernels were removed, however, the extent of the damage was apparent. Not infrequently splendid looking samples are put on exhibition and are no better in this respect than the ear shown in the cut. More frequently such ears, because of their good external appearance, are used for seed and as all the ears are shelled together the worse than worthless condition of the ear is seldom noticed.

The only outward evidence that this ear was not sound was shown in some rows of kernels being slightly raised above others. This peculiar condition is indicative of checked or broken kernels and is probably due to the silks remaining between the rows. When the silks decay the outer covering of the kernel which is in contact with them becomes affected a short distance above the tip. Moisture and heat then cause the kernel to decay and generally the vitality of the kernel is entirely destroyed. (See Fig. 22 for photograph of affected kernels). The whitish spots shown in the illustration are the lower portions of the kernel below the break; the thin whitish lines near the tips of the outer rows of kernels illustrate how the silks affect the outer coat and make it easy for decay to set in.
The fact that such ears appear good from the outside and that they are frequently shelled with others and used for seed is one of the strongest arguments than can be advanced in support of shelling each seed ear separately. Not ten per cent of the kernels on this ear would grow and yet it appeared sound and in good seed condition. An examination of the kernels from each ear would lead to the rejection of all such and as the time required to remove a few kernels from each ear is very little we cannot afford, when we remember the possibilities that lie in a single ear of corn, to neglect to shell each ear by itself, discard all badly damaged ears and pick out the occasional broken or injured kernels which are sometimes present in good ears.

Kernels 1 and 9 germinated but after bursting the outer covering the young plantlet died. The ears from which these kernels were taken were stored in a warm place before they were thoroughly dried out, with the result that growth commenced. Nos. 2 and 3 have been injured probably by the decay of silks between the rows. (See Fig. 21). Kernels injured in this way frequently break off in shelling. They should never be used for seed. Nos. 10, 11 and 12 are all good illustrations of immature
kernels. Notice how the germs of all of them are either blistered or wrinkled. When No. 10 was shelled the tip adhered to the cob leaving the germ insufficiently protected. If this kernel were planted under favorable conditions it would grow, but if the planting is followed by cold, wet weather it will be far more likely to rot than a kernel that had not lost the tip cap. This is an indication of immaturity.

Nos. 11 and 12 show kernels which were so immature that, when shelled, large pieces of cob adhered. Nos. 13 and 14 show immature kernels which shrivelled when dried. Nos. 4, 5 and 6 are all immature but No. 4 has shrunken more than either of the others and presents a dull, dead appearance. Nos. 7 and 15 are very fair both as to shape and degree of maturity; 8 and 16 are excellent. No. 16, with its splendid form and bright, cheerful appearance is especially good.

Fig. 23 shows backs of kernels. Nos. 1, 2 and 10 show an unusually large proportion of the starchy part on the back and a very small percentage of hard horny matter. This is an indication of immaturity. Such kernels always have a dull dead color and are sure to be low in vitality as they are generally pro-
duced by late weak stalks. Nos. 8 and 9 show kernels injured by contact with silks. (See Fig. 21). When No. 9 was shelled the tip was nearly torn off. No. 3 illustrates the same thing only to a less extent. The crown of No. 3 is very thin and weak. No. 11 is a poorly shaped kernel and, in addition, is starchy and-shrunken at the tip. Being thin as well as pointed, its vitality is very low. No. 4 is poor in that the crown is very thin and starchy; 5 and 12 are weak just above the tip as the depression shows. Nos. 7 and 14 are well developed, bright and strong; 6 and 13 are less perfect but are still bright and cheerful kernels. All four carry the horny part to the crown of the kernel.

In selecting seed ears Nos. 2 and 3 should be discarded as
no planter will drop a uniform number of these kernels per hill.

Ears Nos. 1 and 4 have kernels of uniform size and shape and when the butts and tips were shelled off the planter dropped three kernels to a hill 93 to 95 times out of every hundred tests while ear No. 2 tested 74-3's, 19-2's, 6-1's and 1-5.

![Image of ears](image)

**Fig. 25**

**SPACE BETWEEN ROWS.**

Ear No. 3 has about the right amount of space between the rows to insure best results, while ears 1 and 4 illustrate the extreme. Ear No. 1 has too much space showing a deteriorated or "run-out" appearance, and shelling out a low per cent of corn to cob. On the other hand where there is too little space between the rows as in the case of No. 4, the ear generally presents a dull, starchy or immature appearance. The kernels are too pointed or wedge-shaped, leaving a great deal of open
space next to the cob, and are lacking in vitality. Ear No. 2 has a little too much space, while there is perhaps not quite enough on ear No. 5.

**COMPOSITION OF KERNEL.**

<table>
<thead>
<tr>
<th>Parts</th>
<th>Percent Protein</th>
<th>Percent Oil</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crown</td>
<td>13.51</td>
<td>1.00</td>
<td>14.51</td>
</tr>
<tr>
<td>Middle</td>
<td>9.98</td>
<td>3.33</td>
<td>13.31</td>
</tr>
<tr>
<td>Tip</td>
<td>12.26</td>
<td>2.02</td>
<td>24.28</td>
</tr>
</tbody>
</table>

Fig. 26 illustrates a corn kernel divided into three sections—crown, middle and tip. The two most valuable constituents of the kernel are Protein and Oil. Protein is a muscle former; Oil is a fat producer. These constituents are not equally distributed through the kernel, but are formed in greater abundance in some parts than in others. This table shows that the tip portion is richer in protein than either the middle or the crown and that it contains a greater per cent of oil. The tip is also very rich in ash.

This makes it important that the kernels have a full plump tip, not only that they may possess a high feeding value, but that when planted the seed may have a good supply of food which will enable it to produce a vigorous healthy plant.

*Fig. 26*

*Fig. 27*

Fig. 27 shows a cross section of a corn kernel.

(g.) is the germ or chit.

(f. p.) is the floury portion lying just under the germ.

(h. p.) represents the hard horny portion of the kernel.
The following table shows the comparative feeding value of the different parts of the kernel:

<table>
<thead>
<tr>
<th></th>
<th>% Protein</th>
<th>Percent Oil</th>
<th>Percent Ash</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germ (g)</td>
<td>19.28</td>
<td>34.6</td>
<td>10.11</td>
<td>63.99</td>
</tr>
<tr>
<td>Floury portion (f. p.)</td>
<td>7.93</td>
<td>.81</td>
<td>.52</td>
<td>9.26</td>
</tr>
<tr>
<td>Horny portion (h. p.)</td>
<td>10.93</td>
<td>1.03</td>
<td>.65</td>
<td>12.62</td>
</tr>
</tbody>
</table>

The above table shows: First, that the germ is the richest part of the three most valuable feeding constituents. Second, that the white starchy portion has the lowest feeding value. From this we can see the importance of selecting ears having large deep germs and containing a small amount of the floury portion.

Fig. 28

The upper row (Nos. 21 to 37) shows the depth of germ when the kernels are split in two lengthwise through the middle of the germ. Nos. 21, 24, 27, 28, 29, 33 and 35 show very deep germs and are from ears rich in protein and oil, No. 35 being from the ear richest in protein of 1,400 tests, while Nos. 22, 23, 36 and 37 are from ears very poor in feeding value. It will also be noticed that the germs are very small.

The lower two rows show cross sections of kernels. Nos. 2, 4, 14 and 18 are among the poorest, having very small germs and consequently being very low in feeding value. Nos. 12, 16, 15 and 17, are among the very best.
Fig. 29. The kernels in the top row in the above cut are taken from an ear No. 2 shown on the following page, and those in the bottom row are taken from an ear No. 1.

The lower row of kernels in the above cut are from ear No. 1 shown on the following page, and the kernels in the upper row are from ear No. 2. Judging from outward appearances of the ear, little or no difference in their values could be discovered. The ears from which these two rows were taken were almost exactly of the same size, yet ear No. 1 (see cut on following page) weighed 16 per cent more than ear No. 2 and shelled out 20½ per cent more corn than ear No. 2. Ear No. 2 is not only very much poorer in feeding value than No. 1 but has a much lower vitality and would give a weaker plant.

It is very important that the tips of the kernels—the portion next to the cob—should be full and plump so that there is no space between the kernels down near the cob. In selecting our
seed corn it is important that we should do more than look at the ears; we must study the kernels.

Fig. 31. Ear 2 shows space between the kernels next to the cob. Ear 1 is especially strong, showing good constitution.

(See kernels from these two ears in Figs. 29 and 30 on preceding page).
Fig. 32. Nos. 1, 2 and 3 are illustrations of kernels with poor, weak, germs. Note how small and shrunken the germs are compared with No. 6 and No. 7. Nos. 8 and 9 are somewhat better, but the poor shape of their kernels, coupled with their small germs, make them very undesirable kernels. Pointed kernels such as these do not give room for good development of germ. In addition to being pointed these kernels are very thin at the tips, and so are weaker than they appear. Kernels of this shape frequently break off in shelling, especially if immature. No. 2 has a shrunken, blistered germ owing to its immaturity but is of a better form than 1, 8 or 9. Cobs bearing such kernels give a very low percentage of corn to cob as the wedge-like shape of the kernels does not allow them to fit closely. Nos. 3 and 10 are types of very broad, shallow kernels such as are grown in the north where the season is short and where deep kernels could not mature. Kernels 5 and 12 have germs rather under the medium size but are particularly weak at the crown. They do not carry their width up well like 13 and 14. They are thin at the crown giving a chaffy appearance to the ear. Of the remaining four No. 14 is the best, followed by 6, 13 and 7 in the order named. No. 14 is a practically good kernel. It is of the broadly wedged
type, carries its width well down to the tip, has good depth and
good width. It possesses a large, plump, cheerful germ and
the appearance of the whole kernel indicates strength and vitality.

Fig. 33

Fig. 33. Kernels showing large and small germs, taken
from different ears of corn. The left hand kernels in all pairs
come from ears with low feeding value and should be discarded
for seed purposes, while the right hand kernels with large germs
come from ears with a high per cent of oil and protein.
Fig. 34. No. 2 kernels with chaffy portion of cob adhering indicating lack of maturity.

No. 3 shows broken kernels. Ears with kernels of this kind should be discarded.

No. 5—Kernels with the tip portion protecting the germs broken off. While kernels of this kind frequently grow, yet it indicates lack of maturity.

Pairs of kernels Nos. 1, 7, 8, 9 and 10 show good, deep, well-filled germs, thus indicating strong vitality and good feeding value. Nos. 11, 12 and 13 show short germs, indicating weak vitality and low feeding value.
Fig. 35. The first step in the selection of corn is to get the ears out where they can be examined and compared. A long table or a couple of planks placed on barrels or boxes will answer this purpose very well. Arrange the ears with the butts even with the edge of the table.
Fig. 36

SORTING OUT AND DISCARDING POOR EARS.

Fig. 36. Second step. Having selected the ear which most nearly represents the type desired, go over the samples and discard all ears that do not conform to it in size, shape, color and uniformity of kernels.
Fig. 37. Third step. From these selected ears remove two or three kernels and place them, germ side up, in front of the ear from which they are taken. Study the kernels carefully together with the ear as a whole, discarding those ears having faulty kernels.
Fig. 38

SHELLING OFF BUTTS AND TIPS.

Fig. 38. Fourth Step. Next shell off butts and tips. This is absolutely essential in order to secure a good stand of corn, which is so essential to a good yield.
Fig. 39. Fifth Step. Shell each ear separately. Too much importance cannot be attached to this step. See Fig. 21. Shell each ear in a large shallow pan or on a screen, discarding those ears which show poor vitality or are defective in other ways. It is advisable to separate the corn into three grades according to the size and shape of the kernels—large, medium and small sized grains—and then the proper planter plates can be used for the different sizes.
SORTING OUT THE POOR KERNELS, THOSE THAT ARE ROTTEN, BROKEN OR DEFECTIVE.

Fig. 40. Sixth Step. After picking out the damaged kernels, the corn is then ready for the planter test.

When the corn has been tested, graded for the planter and the inferior kernels removed, it should then be placed in bags (gunny sacks preferred), half a bushel in each, and hung up in the attic by wires where there will be thorough circulation of air.
Fig. 41. Seventh Step. After the corn has been graded as just described, it is important to make a planter test in order to get the plates best adapted for the different samples. Do not neglect making this test. If the planter fails to drop the desired number of kernels to a hill 90 to 95 times out of every hundred, the plates should be ground or filed until they will drop the required number. The plate adjusted to each sample should then be put with that sample to avoid any confusion at planting time. Then place the seed in gunny sacks. Put less than two-thirds of a bushel in a sack and then hang it up in a dry, well ventilated place, as in the seed house or in the loft.
Fig. 42. Eighth Step. Calibrating the planter plate so that it drops the required number of kernels per hill.
Ear No. 3 is too blocky, the tip a little too full and the butt too much compressed, the kernels are also too thick or blocky. Ear No. 2 has a good form, the tip is excellent, the butt is slightly compressed and the kernels a little too blocky. No. 1 is an excellent ear of corn in every respect.
CONCLUSIONS.

First: The vitality or germination power of each ear of corn intended for seed, should be carefully tested, and all ears refusing to grow or showing a weak germination should be discarded. This is especially important this year, as over 2,000 samples tested show that the germination of much of the corn is very poor.

Second: Carefully select 50 to 100 of the very choicest ears of your seed corn and plant them on one side of your earliest planted field and if possible on fall-plowed ground, so that it will mature early next fall.

Third: Do not fail to grade the corn and test the planter thoroughly with the seed you intend to use and stay with it until it will drop regularly the number of kernels required in each hill.

Fourth: Do not import seed corn from a distance. Depend upon home grown seed for the main crop.

Fifth: It is very important that all corn intended for use should be harvested not later than October 20th and hung up in a dry and thoroughly ventilated place.

Sixth: Select ears of corn for seed which have kernels of as nearly uniform size and shape as possible, otherwise it will be impossible to secure an even stand with any planter.

Seventh: It is unwise to store seed corn in barrels or boxes, as it will gather moisture, even though it appears to be thoroughly dry. This is especially true during the fall and winter months.

Eighth: Cold does not injure the vitality of corn when it is thoroughly dried and kept dry, but on the other hand, if allowed to gather moisture, freezing will reduce the vitality and may destroy it entirely.

Tenth: In case any seed corn is purchased from seedsmen, insist on having it shipped to you in the ear, either in crates or barrels.

Eleventh: All of this work, that is, the testing of the vitality, the sorting, the shelling and the testing of the planter, should be done before planting time. If put off until the hurry of the spring work is upon us, there is danger that it will not be done at all.
EXPLANATION OF POINTS IN CORN JUDGING

1. TRUENESS TO TYPE OR BREED CHARACTERISTICS. 10 POINTS—The ten ears in the sample should possess similar or like characteristics, and should be true to the variety which they represent. Two representative kernels should be taken from each ear and placed germ side up in front of the ear and studied in connection with type in the ear.

2. SHAPE OF EAR.—10 POINTS—In shape, the ears should conform to variety type. Each ear should be full and strong in the central portion and not taper too rapidly towards the tip. This is indicative of strong constitution and good yield.

3. PURITY OF EAR. (a), GRAIN. 5 POINTS—In color the kernels should be true to variety and free from mixture. For one or two mixed kernels a cut of one-fourth point; for four or more mixed kernels, a cut of one-half point should be made. Difference in shade of color, as light or dark red, white or cream color must be scored according to variety characteristics.

(b), COB. 5 POINTS—An ear with white cob in yellow corn or red cob in white corn should be disqualified or marked zero. This mixture reduces the value of the corn for seed purposes, indicates lack of purity, and tends toward a too wide variation in time of maturity, size and shape of kernels, etc.

4. VITALITY OR SEED CONDITION.—10 POINTS—Corn should be in good market condition; should show good constitution and be capable of producing plants of strong vigorous growth and yield. All indications of freezing or other injury from exposure and all evidences of immaturity such as cob with adhering chaff, black tips caused by the tip cap adhering to the cob, shrunk, dark, or blistered germs, and shrunk, blistered, or starchy backs must be marked according to the judgment of the scorer. When selecting for the best kernel, aside from type, the broadly rounding wedge is most desirable.

5. TIPS. 5 POINTS—Tips should be regular, uniform, and properly proportioned with the body of the ear. The rows should be well carried out and the kernels conform closely to those in the main body of the ear in shape and size. The proportion of tip covered or filled must be considered. Long pointed tips as well as blunt, flattened or double tips, are objectionable.

6. BUTTS. 5 POINTS—The rows of kernels should extend in regular order over the butt, leaving a deep depression when the shank is removed. Opened and swelled butts, depressed and flat butts with flattened glazed kernels are objectionable and must be cut according to the judgment of the scorer.

7. KERNELS. (a), UNIFORMITY OF, 10 POINTS; (b), SHAPE OF, 5 POINTS—The kernels should be uniform in size and shape, making it possible to so grade the corn as to secure even dropping by the planter. This is essential to securing a good stand. Not only should the kernels be uniform on the individual ear but they should be uniform with each ear in the sample. Kernels should be so shaped that their edges touch from tip to crown. The tip portion of the kernel is rich in protein and oil, and hence of high feeding value. Kernels with large germs insure strong vigorous growth as well as richness in quality of kernel.

8. LENGTH OF EAR. 10 POINTS—The length of the ear varies according to variety, type and the characteristics sought for by the individual breeder. Uniformity of length is to be sought for in a sample and a
sample having even length of ears should score higher than one that
varies, even if it is within the limits. Usual length of ears for the north­
er sections of the state, 8½ to 9½ inches; central section 8¼ to 9¾ inches;
southern sections of the state 9 to 10 inches. Very long ears are objection­
able as they usually have poor butts and tips, broad shallow kernels
and hence a low percentage of corn to cob.

9. CIRCUMFERENCE OF EAR. 5 POINTS—The points made on the length
of the ear, differing with the variety types, hold true also in the circum­
ference of the ear. The circumference of the ear should be in symmetry
with its length. An ear too great in circumference to its length is gen­
erally slow in maturing, and too frequently results in soft corn. Dimen­
sions for northern section of the state 6½ inches to 7 inches in circum­
ference; central section 6¼ to 7¾ inches. Measure the circumference at
one-third the distance from the butt to the tip of the ear.

10. (a), FURROWS BETWEEN ROWS. 5 POINTS—The furrows between
the rows of kernels should be of sufficient size to allow the corn to dry
readily, but not so large as to lose in proportion of corn to cob.
(b), SPACE BETWEEN TIPS OF KERNELS AT COB. 5 POINTS—
This is very objectionable as it indicates immaturity, poor constitution
and poor feeding value.

11. PROPORTION OF CORN TO COB. 10 POINTS—The proportion of corn
is determined by weight. Depth of kernels, size of cob, maturity, fur­
rows and space at cob, all effect the proportion. In determining the
proportion of corn to cob, weigh and shell every alternate ear in the
sample. Weigh the cobs and subtract from the weight of the ears which
will give the weight of the corn; divide the weight of the corn by the
total weight of ears, which will give the percent of corn. Percent of
corn should be from 86 to 87. For each percent short of standard, a cut
of one-half points shall be made.
Each sample shall consist of ten ears of corn.

REASONS FOR PLACING
Suggestions for Giving Reasons

1. Name the particular points in which the ear excels or is especially
weak or deficient. Ears in sample which are just medium need not be
mentioned.

2. Name the best, second best and third best ears of the sample and
state why.

3. State the poorest, second poorest and third poorest ears of the sample
and state why.

4. When stating that an ear is low in vitality state what indications lead
you to the conclusion. To illustrate: Ear No. 6 in a given sample is low in
vitality because the germ has been frosted or is of a reddish dull color
indicating a diseased condition, has turned black, has cob chaff attached
tip of kernel, is broken off at tip exposing germ, has a shrunken dull ap­
appearance at back of kernel, looseness or chaffiness on cob indicating lack
of maturity, etc.

5. Avoid mechanical statements. Bring out the main points and let your
reasons show the most serious defects and the most desirable points of
excellence in the individual ears. To illustrate: When you say that a cer­
tain ear is better than another one, never say that the ear is good or better
in a certain point without showing WHERE and WHY it is better in the
point or points mentioned.