3. The Farmers' Variety Test

A COMPARISON of the seed corn planted by different farmers was the first of the demonstrations conducted in Sioux County in 1903, and continued to be the center of interest among the demonstrations during the next twelve years.

PURPOSE AND PLAN OF DEMONSTRATIONS

The purpose of the demonstrations was to show the quality of seed corn planted in Iowa and to determine, if possible, the cause for the low yields produced by many lots of seed.

The demonstrations were conducted on the County Farms by the Extension Department of the Iowa State College, cooperating with the County Boards of Supervisors.

At corn planting time, men from the College, transported by interested farmers in each county in which demonstrations were being conducted, obtained samples of seed corn from different farmers "as they came down the road." Most samples were from planter boxes or from sacks in the field, thus insuring that the seed accurately represented the seed that the farmers were planting.

The different samples of seed were numbered and planted side by side in a field on the County Farm. During most years a careful germination test of several

kernels from each sample was made. As uniform a field as it was possible to find on the County Farm was selected for the demonstrations. The general plan of the field tests, including method of planting, numbers of plots, and records kept, was much the same as described in Chapter 2. Three kernels were planted by hand in each hill.

DIFFERENCES IN YIELD

The ten-year average yield of 5,245 farmers' samples was 55.4 bushels per acre. The best tenth of the samples yielded 66.0 bushels, or 10.6 bushels more than the average of all. The poorest producing tenth yielded only 41.3 bushels, or 14.1 bushels less than the average and 24.7 bushels less than the best tenth.

The spread in yield between the average of the best tenth and of the poorest tenth varied from 9.2 bushels in Pottawattamie County in 1908 to 46.7 bushels in Polk County in 1905.

Thus one farmer in ten was planting seed which yielded an average of 11.7 bushels per acre more than the average of the other nine. The facts that about 12 bushels per acre average annual loss was realized by nine of ten farmers, and that a 25 bushel loss was realized by one in ten only because they were planting less productive seed than some of their neighbors, were the first and probably the most important lessons taught by the County Farm demonstrations.

It is not surprising that farmers flocked to the Special Seed Corn Trains, Farmers' Institutes, and Fairs to learn how to select seed that would produce better yields of corn of better quality. They wanted to know "Why" and "How." They were told that differences in yield were due largely to differences in stand and that differences in stand were due to differences in germination. Barren stalks and stalks producing only nubbins were given as other important causes of low yields.

RELATIONSHIP OF STAND TO YIELD

A summary which shows the relationship of stand to yield of farmers' samples as found in the average of 83 demonstrations in 36 counties during ten years is shown in Figure 3.1.

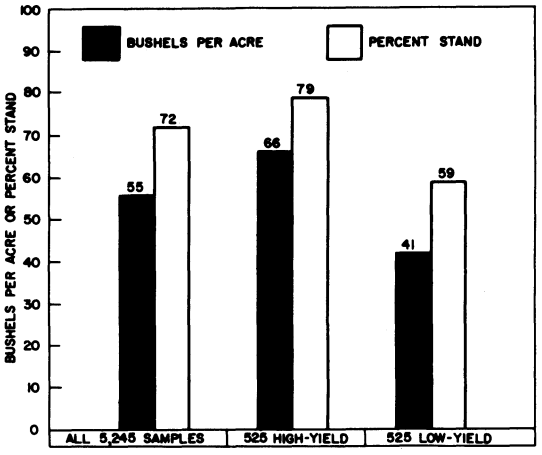

Fig. 3.1. Relation of stand to yield of farmers' samples. Summary of 5,245 samples in 83 demonstrations in 36 counties during the ten years 1904 to 1913, inclusive.

Records of about 25,000 field plots are involved in this study of farmers' varieties. The large number of plots and the consistency of results from demonstration to demonstration and from year to year lend confidence to the accuracy with which the data show the condition of seed that was being planted.

The ten percent best yielding samples had stands of 78.8 percent as compared with 71.6 percent for the average of all and only 58.9 percent for the average of the ten percent with the lowest yields.

The relationship of yield to stand for the average of all demonstrations is shown in Figure 3.2. All farmers' samples in all demonstrations were divided into ten groups according to the percent of stand. The first group

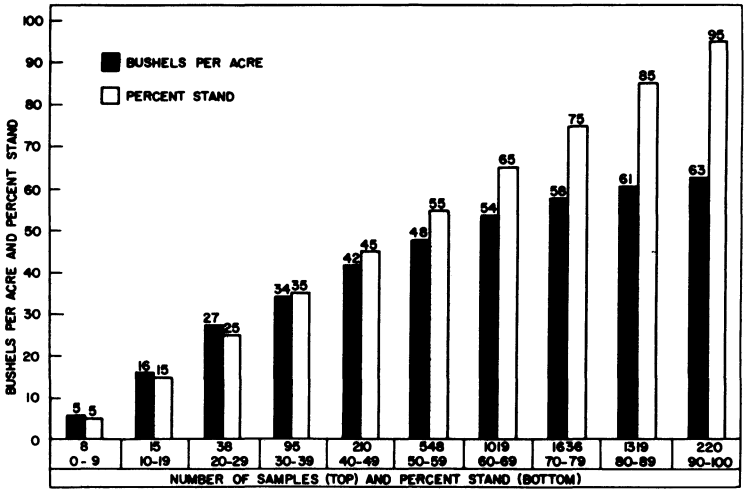

Fig. 3.2. Relation of yield to stand of farmers' samples.

had less than 10 percent and the tenth group had from 90 to 100 percent stand.

The regularity with which the average yield increased with the increase in stand, as shown in Figure 3.2, lends confidence to the statement that difference in stand was a major cause of the wide differences in yield. However, it must be remembered that difference in stand was only one cause of differences in yield. Barren stalks and stalks having only nubbins also were important causes of low yield.

RELATION OF GERMINATION OF SEED AND STAND TO YIELD

Farmers were told that if they would make a germination test of six kernels taken from each ear and plant only those ears that showed six strong stem and root sprouts, they could insure good stands and relatively high yields. A study of data from the demonstrations shows the validity of the recommendation (see Figure 3.3).

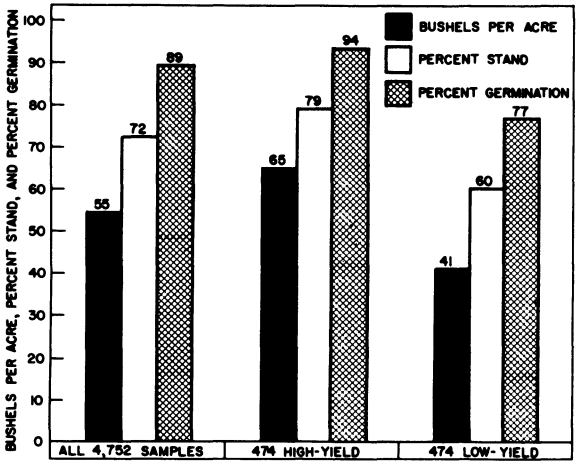

Fig. 3.3. Relation of germination and stand to yield of farmers' samples. Summary of 4,752 samples in 73 demonstrations in 35 counties during the eight years, 1905 to 1913, except 1907.

The germination of the 10 percent high-yielding samples showed 93.6 percent of live kernels, including those with both strong and weak sprouts. Of the 93.6 percent live kernels, 84.5 percent produced stalks that survived until harvest, producing 79.1 percent stand and 64.8 bushels of corn per acre.

In sharp contrast, germination tests of the 10 percent lowest yielding samples showed only 77 percent of live kernels, of which only 78.1 percent survived, to produce only 60.1 percent stand and 41.1 bushels per acre.

The records of all samples of which germination tests were available were divided into groups according to the percentage germination (see Figure 3.4). Yields increased with as great regularity as could be expected in view of the small number of samples in some groups, and the varying conditions from county to county and from year to year. Yields varied from 15.1 bushels per acre for the average of the samples which showed only 10 percent or less germination to 59.7 bushels for the samples that showed 100 percent germination.

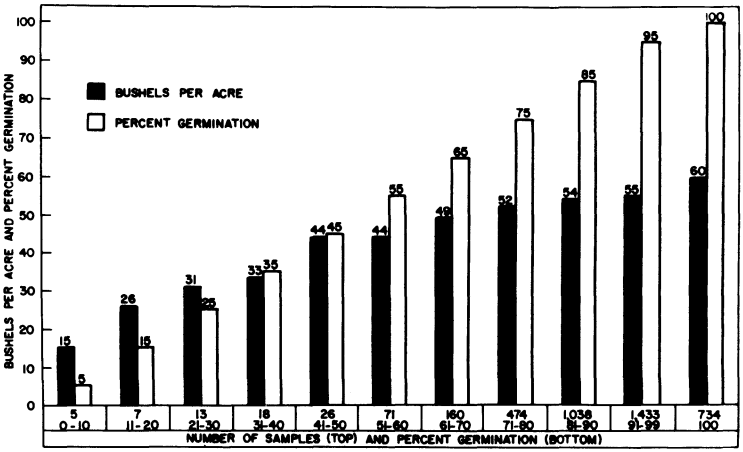

Fig. 3.4. Relation of yield to germination of farmers' samples.

THE DEMONSTRATIONS WERE EFFECTIVE

The results of the demonstrations were published widely. Within a few years the testing of each ear of seed corn had become a common practice among progressive farmers.

BARREN STALKS AND STALKS PRODUCING ONLY NUBBINS

The fact was recognized that the low yields of many farmers' samples were caused by large numbers of barren stalks and by stalks producing only nubbins, as well as by poor stands. However, it was assumed by many that barrenness and the ability to produce only nubbins was largely a matter of vitality, which could be observed in the germinated seedlings. In the first published reports, those for the year of 1909, the cause of low yields is stated as follows: "This means that low yields were caused principally by corn which failed to grow, and that the difference in vitality was the greatest difference between the several samples of seed."

The "barren stalk" and "nubbin" factors were recognized in the 1909 reports of the single ear tests, which are discussed in Chapter 5. The 1909 reports state: "There are a few instances in which ears of corn that gave the same percentage of stand differed widely in yield, and ears that gave approximately the same yield differed widely in percentage of stand. This may be explained by a difference in vitality. The ear which gave a low yield but produced a correspondingly high stand was undoubtedly a weak ear and produced stalks many of which produced only nubbins or worthless ears. A careful test of each ear and the discarding of those which are weak or dead would greatly increase the yield."

The importance of barren stalks and nubbins in relation to yield of farmers' samples was recognized in some Demonstration Farm Reports for the year 1911 in the following statements: "Low yields are usually caused by poor stands.... The low yields produced by many samples were caused by barren stalks and nubbins." However no cause is given for barren stalks and nubbins other than from weak seed which could be detected in the germination test.

A different idea appears in the reports for the year of 1912: "Poor stands are the greatest causes of low yields. ... However, differences in yields may sometimes be due to other causes. For example, sample 48 (in the Winnebago County Report) produced 58 bushels per acre with 87 percent stand, while No. 44 produced only 43 bushels with exactly the same stand. This can be accounted for only by differences in the producing power of the corn." This appears to mean that barrenness and nubbin production were considered to be inherited qualities.

The percentage of barren stalks and marketable ears in relation to yield of farmers' samples was studied in the preparation of this report. The close relation of barren stalks and of marketable ears to thickness of planting was discussed in Chapter 2. The differences in yield, barren stalks, and marketable ears in that study were due only to differences in thickness of planting and not to

inherited differences in the seed, because the seed for the different thicknesses of planting was always the same.

In this study of the relation of barren stalks and marketable ears to yield of farmers' samples, the yield, percent of barren stalks, and of marketable ears found in the thickness of planting tests with the same number of stalks per acre as produced by the farmers' samples were used as checks, as a measure of causes of high or low yield other than the stand of stalks.

An eight-year summary of the loss or gain in yield of farmers' samples from other causes than stand is shown in Figure 3.5. The eight-year average yield of all farmers' samples was 54.6 bushels per acre, produced with an average of 7,700 stalks per acre. This was 94.1 percent of the 58 bushel average yield produced with the same number of stalks in the thickness of planting tests.

The ten percent best farmers' samples produced 64.8 bushels per acre with 8,400 stalks per acre. They would

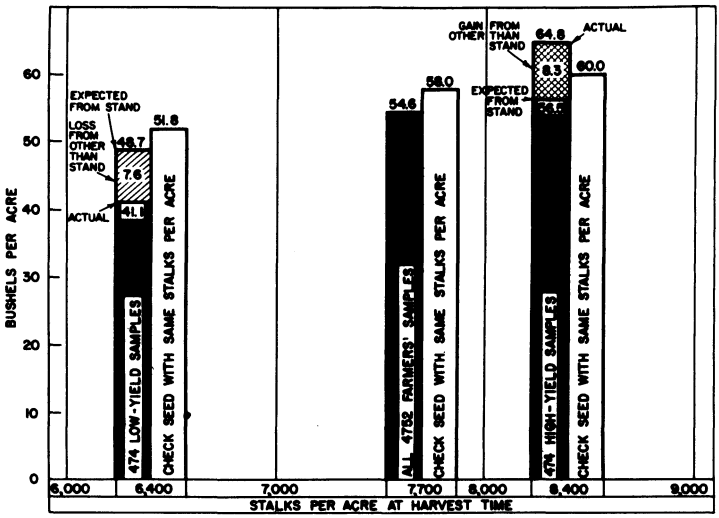

Fig. 3.5. Loss or gain in yield of farmers' samples from causes other than stand differences.

have produced only 56.5 bushels if they had produced only the 94.1 percent of the 60 bushels from the same number of stalks per acre in the thickness of planting tests. It appears, therefore, that only 1.9 bushels of the 10.2 bushels greater-than-average yield was due to the better stand and 8.3 bushels was due to other causes.

Again, the ten percent poorest farmers' samples produced 41.1 bushels per acre with 6,400 stalks per acre. They would have produced 48.7 bushels if they had produced 94.1 percent of the 51.8 bushels produced from the same number of stalks per acre in the thickness of planting tests. So it appears that only 5.9 bushels of the 13.5 bushels less-than-average yield was due to the poorer stand and 7.6 bushels to other causes.

Eighty-one percent of the 10.2 bushels higher-than-average yield of the ten percent best samples was evidently due to other causes than stand differences. Fifty-six percent of the 13.5 bushels lower-than-average yield of the ten percent poorest samples appeared due to such other causes.

Higher yields than expected from the stand of the ten percent best farmers' samples and lower yields than expected from the poorest samples were obtained in each of the 45 county demonstrations from which data needed to make the study were available.

Thus it appears that there was some factor, or factors, other than germination of the seed, or survival of the stand, that caused a few farmers' samples to produce much more and a few others much less than the average of the seed that was planted in any county.

RELATION OF BARREN STALKS TO YIELD

Differences in yield can be due only to differences in the number of ears per acre or the average weight of the ears, or to both. The average farmers' sample produced 7,700 stalks per acre, 6.1 percent of which were barren as shown in Figure 3.6. This was 15.1 percent more than

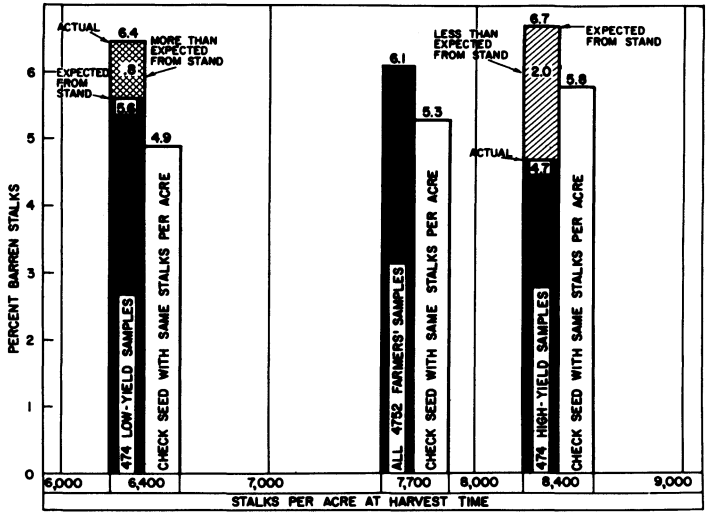

Fig. 3.6. Higher or lower percents of barren stalks from causes other than the thickness of stand.

the 5.3 percent barren stalks produced by 7,700 stalks per acre in the thickness of planting tests.

The 10 percent high-yielding samples produced 8,400 stalks per acre, only 4.7 percent of which were barren. They would have produced 6.7 percent barren stalks if they had produced 15.1 percent more than the 5.8 percent barren of the 8,400 stalks in the thickness of planting tests. A study of the data from all tests shows that the high-yielding samples produced fewer barren stalks than expected from the stand obtained in 35 of the 45 county demonstrations for which the study was made, produced the same in seven, and more in only three cases.

The 10 percent low yielding samples produced 6,400 stalks per acre, 6.4 percent of which were barren. They would have produced only 5.6 percent barren stalks if they had produced 15.1 percent more than the 4.9 percent barren of the 6,400 stalks in the thickness of planting demonstrations. The low-yielding samples produced more barren stalks than expected from the stand in 35 of

the 45 demonstrations, produced the same in three, and less in seven cases.

Thus, it appears that a considerable part of the high-yielding quality of the best farmers' samples was due to an inherited relative freedom from barrenness.

THE RELATION OF MARKETABLE EARS TO YIELD

As the thickness of planting increased in the thickness of planting tests (Chapter 2) the percent of marketable ears decreased. However, in the farmers' variety tests the high-yielding samples with their thicker stands produced more marketable ears than the average, and the low-yielding samples with their thinner stands produced less marketable ears than the average.

The 10 percent high-yielding samples produced 4.5 percent more and the 10 percent low-yielding samples 2.6 percent less marketable ears than was expected from the stands of stalks produced by them (see Figure 3.7).

High-yielding farmers' samples produced more marketable ears than expected from the stand in 43 and less in only two of the 45 county demonstrations. On the other hand, low-yielding samples produced fewer marketable ears than expected in 39 and more in only six of the 45 demonstrations.

The ability to produce more or less than average marketable ears was, therefore, an important factor in the production of high or low yields of corn. The best farmers' samples owed more of their higher yielding ability to the production of high percentages of marketable ears than the poorest samples owed their low yields to low percentages of marketable ears.

Thus we see now that the making of germination tests of each ear was a very valuable means of discarding low-yielding seed but that it fell far short of selecting the high-yielding seed that had been selected and prepared for planting by a few farmers. Good germination was an

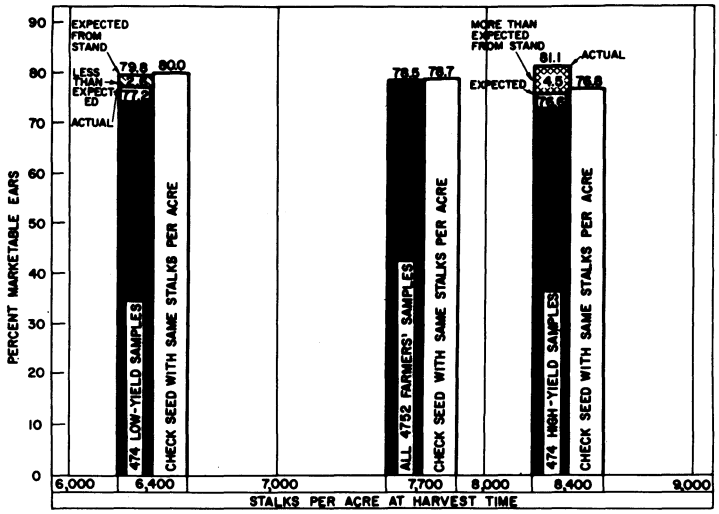

Fig. 3.7. Higher or lower percent of marketable ears from causes other than thickness of stand. Summary of tests of farmers' varieties in 35 counties during the eight years, 1905 to 1913, except 1907.

important factor in the selection of high-yielding samples but some hidden factors that caused them to produce few barren stalks and uniformly good ears were even more important. It was the elimination of the germination and stand factors that led to the finding of consistently high-yielding strains of seed corn in both Clinton County, Iowa, and Woodford County, Illinois. (See Chapters 7 and 8.)

SECOND AND THIRD YEAR FARMERS' VARIETY TESTS

After several years of the County Farm demonstrations it became apparent that there were a few men in each county who had especially good strains of corn. Tests were conducted in 1911 and 1912 to learn if such apparently superior strains would produce high yields consistently from year to year. In 1911 a few men whose seed had done particularly well in 1910 were asked to

provide seed for a second year's test. This was done in eight counties in 1911 and repeated in eight counties in 1912. Also in 1912, in four counties those men whose seed had yielded well both in 1910 and 1911 brought in seed for a third year's test. Such seed was planted beside samples obtained for the first time from planter boxes.

About half of the second-year samples repeated their performance, by outyielding the average of all first-year farmers' samples. There was only one case in which none of the second-year samples outyielded the average of the first-year farmers' samples. There was also one case where none of the third-year samples yielded better than the average of the first-year farmers' samples. An average of four two-year samples per county outyielded the average of 59 first-year farmers' samples both years. The average two-year advantage was 6.1 bushels per acre. The average three-year advantage of the three-year samples was 5.5 bushels per acre. Only one to two bushels of the six bushel advantage of the two-year and

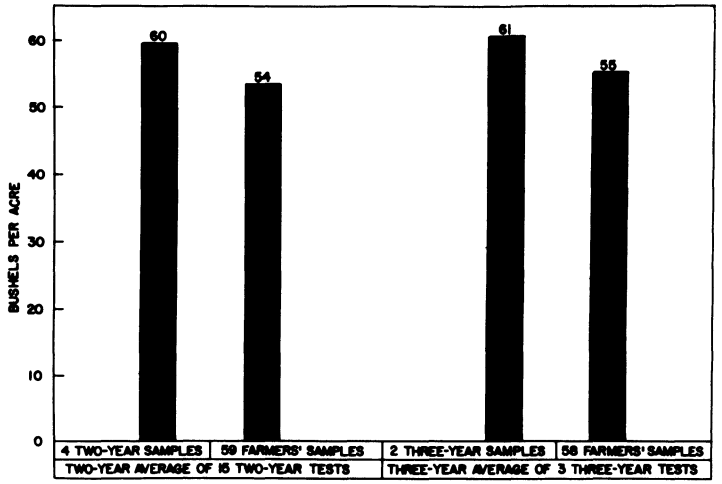

Fig. 3.8. Yield of second- and third-year farmers' varieties compared with all first-year farmers' samples.

three-year samples could be attributed to better-than-average stands, as shown by comparing the variety tests with the thickness of planting tests. The two-year and three-year samples produced fewer barren stalks and more marketable ears than the average of all first-year farmers' samples. These two-year and three-year tests verified the conclusion that there were a few men who had strains of corn that were superior for their area (see Figure 3.8). This led to the Clinton County, Iowa, and the Woodford County, Illinois, Corn Yield Tests. Still further, it led to the Iowa State Corn Yield Test, in which several strains of corn were found that came into widespread use as open pollinated varieties.