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Corn and Cotton Experiments for 1908.

by

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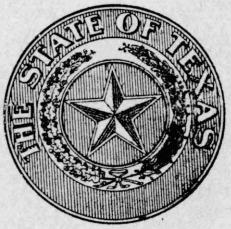

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CORN AND COTTON EXPERIMENTS FOR 1908.

by

W. C. WELBORN

Vice Director and Agriculturist

Experiments were mostly conducted with corn and cotton, with a view to throwing some light on methods of preparing the land, depths of plowing, fertilizer requirements of the soils and crops, and variety tests of corn and cotton.

It is singular that while almost the whole of the literature of agriculture for perhaps a hundred years has been filled with advice to plow deep, subsoil, etc., a vast majority of the cotton land especially is prepared by lapping on an unbroken center with shallow plow furrows. In West Texas perhaps a majority of the cotton land is prepared with one furrow to the row of a lister or a middle burster, breaking perhaps half the surface and covering the other half. It is noteworthy, too, that a vast majority of the very few experiment station results, North and South, East and West, have rather generally shown nothing better than negative results for the deeper and more expensive methods of preparing the land so commonly advocated in the literature of agriculture. It would seem of highest importance, then, that this primary operation of farming should be better understood, and the best method of preparing the land, consistent with the cost of the operation, should be discovered.

Three acres of land that had been in cotton well fertilized in 1907, were prepared in winter as follows: Acre No. 1 was listed on the old cotton middle without running a center furrow and the bed was finished, the turn plow running three inches deep as nearly as could be judged. The beds were dragged down, and planted at the usual time. No. 2 was center furrowed and bedded, the plow running six inches deep as nearly as could be judged, and the beds were dragged down as before. Acre No. 3 was flat broken 6 inches deep, harrowed, etc. All were fertilized alike, and planted with several varieties of corn. Selecting the two kinds of corn common to all the acres for comparison, we have results shown in table No. 1

No. of Acres	Preparation.	Yield in bushels, per acre.
1	Bedded on hard center 3 inches deep.	33.15
2	Bedded on center furrow 6 inches deep	31.85
3	Flat broken 6 inches deep	33.8

Average of 2 and 3 deeply prepared..... ... . 32.82
Apparent advantage for shallow preparation .... .33

This result involving 3 acres of land, divided into 12 different plots averaged so close together in yield as to justify the conclusion that the different methods of preparation used in 1908 were of equal merit so far as production was concerned. The year was one of more than average rainfall, and several times during the spring and summer the land appeared to be soaked to its full capacity. During one period, however, the corn did suffer from drouth, but no difference was observed in the way the different acres stood the drouth. These results are closely in accord with several years results at one Alabama station and at several other stations where three to four inches in depth of plowing always compared well with 6 to 8 inches. The practical lesson to be learned from this experiment, if it proves generally true for the different soils and seasons, would result in cheaper and more rapid preparation of the land. It is a well known fact that a good pair of horses or mules working on average land, will turn a furrow whose depth multiplied by its width will make about 50 inches. Therefore a pair of mules or horses can pull comfortably a plow or plows cutting 16 inches a little over three inches deep. The same team would pull an eight inch plow slightly over six inches deep, breaking just half the acreage as with the larger plow running the shallow depth.

Fertilizer.

It has generally been found in the past that mixtures of ingredients furnishing nitrogen and those containing phosphoric acid are profitable on the soils of this Station, a rather poor sandy postoak land, with a very tight, tough clay subsoil. Hence various combinations of cottonseed meal to furnish nitrogen, and acid phosphate to furnish phosphoric acid were tried. Four acres were each divided into four parts. On one part of each acre 300 pounds per acre of a mixture of equal parts of meal and phosphate were drilled in the row with a fertilizer distributer several days before planting; on another part the same amount of cottonseed meal alone; on another part an equal amount of acid phosphate alone; and on the remaining division of each three parts acid phosphate and one part meal, the same amount per acre.

TABLE II.

Fertilizer Tests With Corn.

No. of Plot.	Fertelizer.	Yield in Bushels per Acre.
1, 5, 9, 13.	Equal parts C. S. meal and Acid Phosphate.	34 75
2, 6, 10, 14.	C. S. Meal Alone.	33.15
3, 7, 11, 15.	Acid Phosphate Alone.	28.05
4, 8, 12, 16.	3 Parts Phosphate and 1 Part Meal.	27.00

It was early evident that the end of the field where the phosphate and meal equal parts and the meal alone were used, was better soil on

account of catching the drift from the other parts of the field. The results are, therefore, unsatisfactory and inconclusive.

Acres, 1, 2, and 3 were in cotton in 1907, well fertilized and well worked. Acre No. 4 was in corn and sorghum in 1907, and also grew a heavy coat of crab grass. The average yield of Nos. 1, 2 and 3 was 32.6 bushels. Acre No. 4 yielded 23 bushels, making a difference of 9.6 bushels against the corn, sorghum and crab grass land. The different acres were fertilized alike, and only the varieties were compared that were common to all the acres. This result emphasized the well known fact that corn, sorghum, and crab grass make a poor preparation for a following corn crop, while cotton well fertilized and well worked makes an excellent preparation for corn.

VARIETIES.

Ear-Row Test.

Many experimenters have used the ear-row method of testing seed corn. That is, each ear of corn is planted in a single row and the yields of these rows are compared. In this way it has appeared that some ears of corn have vastly greater yielding power than other ears. The product of the high yielding ears have been planted for a number of years in more or less successful attmepts to produce high yielding strains of corn. It has often seemed to the writer strange that different ears of corn of the same variety, of equal soundness, and apparently equal in all desirable qualities, should possess inherent yielding powers so different from each other. With a view of seeing, therefore, how much of these observed differences in yield may be due to the irregularities of soil or other unknown causes, each ear was made to plant in these tests, not one row, but four; and each ear was therefore not only tested against other ears, but against itself.

Taking one variety of corn, Bennett's Selection, common to all the 16 plots, and comparing the highest yielding row from each ear with the lowest yielding row from the same ear, we have the results shown in Table III.

TABLE III.

No. of Plot.	Highest yield in lbs of ear corn per row	Lowest yield in lbs. of ear corn per row	Percentage difference in yield
1	41	34	20.6
2	49	37	32.4
3	38	34	21.7
4	37	27	37.
5	42	34	23.5
6	54	38	42.1
7	43	32	34.4
8	45	41	7.4
9	54	45	20.
10	42	37	13.5
11	39	34	14.7
12	41	38	8.
13	41	30	30.
14	37	26	42.3
15	34	22	54.4
16	29	20	44.4

Average percentage difference in yield between the highest and lowest rows from each ear.....27 per cent

These differences are about as great as the differences in average yields of the different varieties, and greater than the average differences of different ears of the same variety. Such results appear to prove that differences in soil, and other causes, unknown, play a larger part in resulting yields than the difference in inherent yielding-power of different ears. Indeed, since each grain of corn might be fertilized by pollen from a different stalk, there would seem almost as much reason to expect each grain of an ear to differ in yielding power from any other grain on the same ear, as there would be to expect the different ears to differ in yielding power from each other.

These results lead us to doubt the practical value of the ear-row method of corn testing. With cotton or other crop that cross-fertilizes little, the individual plant is the unit from which to select pure strains. With corn, which so readily and generally cross-fertilizes, the individual grain is the unit, and not the individual ear.

VARIETY TESTS OF CORN.

A large number of varieties of corn, competing for prizes at the Dallas State Fair were tested in comparison with a selection of corn made by Prof. R. L. Bennett, of this Station, after some years test by the ear-row method, and a sample of corn of unknown breeding, selected out of the crib at planting time. The crib selected seed and Bennett's Selection were planted on all the 16 plots. We had only a small amount of seed of the other varieties, and planted two kinds in each quarter acre, along with the Bennett and crib corn. To do away as much as possible with irregularities in the soil, the different kinds alternated with each other in the rows.

TABLE IV.

Variety Test of Corn.

Plot No.	Name of Variety	Yield Per Acre in Bushels.
1.	Crib Selected.	46.66
	Bennett's.	33.54
	Corn from Nacogdoches.	32.5
	Dallas Fair No. 9.	30.2
2.	Crib.	37.08
	Bennett's.	36.
	Dallas Fair No. 10.	35.2
	Nacogdoches Corn.	32.3
3.	Bennett's.	30.
	Crib.	26.66
	Nacogdoches.	25.
	Dallas Fair No. 39.	23.12
4	Crib.	33.33
	Dallas Fair No. 50.	28.54
	Bennett's.	28
	Dallas Fair No.	20

Plot No.	Name of Variety	Yield Per Acre in Bushels
5.	Dallas Fair No. 14.	2.22
	Crib.	1.61
	Bennett's.	31.45
	Dallas Fair No. 8.	30.41
6.	Crib.	36.66
	Bennett's.	36.04
	Dallas Fair No. 12.	33.54
	Dallas Fair No. 5.	25.41
7.	Bennett's.	31.66
	Dallas Fair No. 6.	28.33
	Dallas Fair No. 2.	27.08
	Crib.	24.16
8.	Bennett's.	35.66
	Dallas Fair No. 4.	27
	Crib.	26.66
	Dallas Fair No. 3.	26.45
9.	Bennett's.	40.62
	Crib.	39.16
	Dallas Fair No. 47.	36.25
	Dallas Fair No. 60.	23.33
10.	Dallas Fair No. 41.	37.5
	Crib.	34.57
	Dallas Fair No. 38.	34.44
	Bennett's.	32.77
11.	Crib.	32.91
	Bennett's.	31.25
	Dallas Fair No. 45.	28
	Dallas Fair No. 51.	Stand Deficient.
12.	Bennett's.	32 7
	Dallas Fair No. 11.	28.33
	Dallas Fair No. 55.	26.04
	Crib,	23 33
13.	Dallas Fair No. 16.	30.20
	Bennett's.	30
	Dallas Fair No. 48.	27.3
	Crib	24.4

Plot No.	Name of Variety	Yield Per Acre in Bushels
14.	Bennett's. Crib. Dallas Fair No. 15. Dallas Fair No. 40.	28.47 24.44 Deficient Stand. Deficient Stand.
15.	Crib. Bennett's. Dallas Fair No. 75. Dallas Fair No. 56.	24.16 24 23.75 19
16.	Dallas Fair No. 46. Bennett's. Crib. Dal as Fair No. 43.	22.7 20 19.75 17.76

It will be noticed that generally the crib selected corn or the corn selected by Professor Bennett leads in yield. These two vary greatly when compared with each other. Taking the average of each of all of the sixten plots there is not difference enough to warrent the conclusion that one of these two kinds of seed was better than the other.

Of the thirty-two kinds of corn exhibited at the Dallas Fair by members of the Texas Corn Growers' Association only one, No. 41, in Plot 10, showed material increase over both of the home grown kinds. This increase was 2.93 bushels over the crib selected seed in the same plot. In one other, Plot 13, corn No. 16 produced .20 bushels more than the Bennett Corn, standing next highest. We do not have the names and addresses of the breeders of these various samples of corn, but we understand all of them were grown by Texas farmers, and most, if not all, are supposed to represent some years of seed breeding or careful selection. The stands of all the kinds were poor, necessitating much replanting, and the home-grown seed seemed to suffer less than the other kinds in this particular. The replants all did poorly, and this fact doubtless accounts for part of the low yields recorded.

The conflicting and disappointing results of most of the kinds of corn supposed to be most highly improved, would seem to justify caution before buying seed at a distance, whatever the claims may be as to purity and improvment in yielding power. So far as this season's results indicate the improvement affected was local, was fanciful, or failed to be transmitted in the crops grown here.

COTTON EXPERIMENTS

Thirteen acres of cotton were grown in all. Tests of the methods of preparing the land, fertilizing, varieties, thick and thin spacing of plants, and early and late planting, were made.

TABLE V.
Methods of Preparing Cotton Land.

No. of acres	How Fertilized	Method of Preparation	Yield per acre of seed cotton
1	Alike	Bedded 3 in. deep on unbroken centre	716 pounds
2		Centre-furrowed—bedded 3 in. deep	765 "
8	Alike	Bedded on hard centre 3 in. deep	880 "
9		Bedded on hard centre 6 in. deep.	795 "
5	Alike	Centre-furrowed and plowed 3 in. deep	810 "
6		Centre-furrowed and plowed 6 in. deep	826 "
	Average yield with centre-furrow.....		.800 pounds
	Average yield without centre-furrows.....		.797 "
	Average yield with 3-inch plowing		.793 "
	Average yield with 6-inch plowing...		.815 "

It will be noticed that there was no material difference in yield that can be attributed to the method of preparing the land. Several other acres were also prepared in the same way, some shallow and some deep, and while fertilized somewhat differently, the yields are about as close together as those shown in Table V. It was evident to all observers throughout the season that the method of preparing the land was having no apparent effect on the growth of the crop. The season was so moist throughout that all cotton grew too large, and this test should be repeated during other seasons.

Not enough work has been done to make sure, but there is evidence to warrant the prediction that the rather general and unqualified advice found in Southern agricultural literature of today to "plow deep" will have to give way, just as the universal advice of twenty-five years ago to "subsoil," has given away to the modified view.

The West Texas cotton farmer who prepares, plants, and cultivates, with a little extra help, 80 to 100 acres of cotton, could not do so but for his four-horse team and his middle "buster," preparing six to eight acres a day by cutting half the surface five or six inches deep and covering the other half. This ability to cultivate a large area gives him a tremendous advantage over any other cotton farmer in the world. He makes about as much cotton to the acre, one-and-one-half times to twice as much to the mule, and **three to four times as much to the man engaged, as any other cotton farmer in the business.** We should be very sure of being able to **show him** before advising a change in his methods of preparing land.

TABLE VI.

Fertilizer Tests With Cotton.

No. of acres	Fertilizers Used	Yield Seed Cotton per acre
1 and 2	300 pounds complete fertilizer	740 pounds
3 and 4	200 pounds Acid Phosphate alone	752 "
5 and 6	100 lbs. cotton seed meal and 200 lbs. acid phosphate	811 "
7	15 pounds Nitrate Soda, 75 pounds Cotton Seed Meal and 200 pounds Acid Phosphate	802 "
8.	250 lbs. dried and ground manures made from feeding C. S. Meal and hulls, 175 lbs. Acid Phosphate	900 "
9.	255 lbs. dried crushed manure, 190 lbs. Acid Phosphate	900 "
10 and 12	180 lbs. Acid Phosphate, 120 lbs. cotton seed meal	846 "
11.	25 lbs. Nitrate Soda as a side dressing applied June 2	780 "

These results are not considered to be very decisive. The acres having 200 pounds acid phosphate made practically the same as those having 300 pounds complete fertilizer. Those having 200 pounds acid phosphate and 100 pounds cottonseed meal made materially more than those having the complete fertilizer and those having acid phosphate alone.

Where a small amount of cottonseed meal was displaced by nitrate of soda the yield was not materially affected.

On acres 8 and 9, where some fresh manure made from feeding beef steers on hulls and meal and the manure was dried and ground and combined with acid phosphate, decidedly the best yields were obtained. This dried manure was analyzed, and an amount added to the phosphate such that this mixture furnished about the same nitrogen and phosphoric acid that 100 pounds of meal and 200 pounds acid phosphate would furnish.

On Acres 10 and 11 a little more cottonseed meal and a little less acid phosphat than on Acres 5, 6, and 7, were used, and the yields were somewhat better.

On Acre 11, no fertilizers were used at planting time, but nitrate of soda, 25 pounds per acre, was used as a side application on June 2nd. The yield was less than on any of the acres, except the first four, and the crop was distinctly later. It is probable that inequalities of soil somewhat vitiated results. It would appear that all this land had been fertilized and built up during the preceding years so that smaller applications would have been more profitable.

Variety Tests of Cotton.

Seed breeding and selection are among the livest questions in the literature of agriculture today. Cotton varieties, especially in the new sections being invaded by the boll weevil, are matters of extreme interest. Not only are commercial seed growers and dealers claiming wonderful results in producing seeds of great producing power and extreme earliness, but agricultural investigators and Government agents are devoting much of their effort in a propoganda for good seed. Good seed of cotton generally means, or is made to mean, seed of a short staple cotton improved so as to yield more than other cotton.

Some believe there is some cotton, somewhere, if it could only be found, that will yield materially more anywhere that cotton grows than any other kind in existence. Others believe certain kinds are best for certain sections and conditions, while other kinds suit other places and conditions. Variety tests of cotton heretofore have generally seemed conflicting and unsatisfactory at the experiment stations of the Cotton States, but for some few years now results have appeared somewhat more in agreement, the different stations with each other and the same station with itself for different years.

Considering the large amount of money annually paid out for cotton seed, largely on what would seem extravagant claims of improvement in yielding power, it would appear well to check up and see how far we have advanced in real improvement of cotton, whether we are investigators or commercial seed growers.

Table VII shows the yield of lint cotton and value of lint and seed of each of the short staple cottons tried, the seed being valued at $15.00 a ton in all cases. The long staple cottons were so deficient in yield as to be entirely unprofitable, and then we have no long staple market here and no ready means of getting it judged. One kind, Prof. R. L. Bennett's Selection, was grown on every acre. Most of the kinds were grown on from one to several acres.

TABLE VII.

Yield and Val e of Varieties of Cotton per Acre.

No. of Acre.	Name of Variety.	Yield Lin	Value of Lint	Value of Lint and Seed.
1.	Excelsior	297	8½ cts.	$29.75
	Yellow Bloom	245.7	8½ cts.	24.88
	Triumph	245	8½ cts.	24.50
	Gold Coin	207.69	8½ cts.	20.92
	Bennett's	246.57	8½ cts.	24.44
2.	Bennett's Selection	283	8½ cts.	$28.16
	Rowden	243	8½ cts.	24.45
	Triumph	237	8½ cts.	23.69
3.	Triumph	272.5	8½ cts.	$27.24
	Bennett's Selection	274	8½ cts.	27.13
	Early Prolific	243	8½ cts.	24.90
	Rowden	232	8½ cts.	23.30

No. of Acres	Name of Variety.	Yield of Lint	Value of Lint	Value of Lint and Seed
4.	Cook's Improved	254	8½ cts.	$25.35
	Bennett's Selection	249	8½ cts.	24.66
	Triumph	243	8½ cts.	24.35
	Rowden	230	8½ cts.	23.12
5.	Early Prolific	278	8½ cts.	$29.10
	Bennett's	281	8½ cts.	27.62
	Triumph	273	8½ cts.	27.32
	Boyett's Gin Run	257	8½ cts	25.79
6	Boyett's Gin Run	292	8½ cts.	$29.32
	Bennett's Selection	276	8½ cts.	27.37
	Triumph	268	8½ cts.	26.80
	Georgia's Best	252	8½ cts.	25.20
	Rowden	208	8½ cts.	20.92
7.	Bennett's Selection	277	8½ cts.	$27.42
	Triumph	270	8½ cts.	27.00
	Boyett's Gin Run	253	8½ cts.	25.53
	Rowden	209	8½ cts.	21.43
8.	Bennett's Selection	315	8½ cts.	$31.22
	Boyett's Gin Run	288	8½ cts.	29.07
	Cook's Improved	281	8½ cts	27.08
	Early Prolific	262	8½ cts	26.82
9.	Toole	306	9¼ cts.	$32.70
	King	317	8½ cts.	31.98
	Bennett's Selection	305	8½ cts.	30.24
	Cook's Improved	284	8½ cts.	28.34
	Schley	262	8½ cts.	26.53
	Boyett's Gin Run	250	8½ cts.	25.25
	Peterkin	242	8½ cts.	24.24
10.	King	306	8½ cts.	$30.87
	Bennett's Selection	304	8½ cts.	30.10
	Toole	270	9¼ cts.	28.90
	Triumph	270	8½ cts.	27.00
	Boyett's Gin Run	254	8½ cts.	25.64
	Schley	246	8½ cts.	24.96
	Rowden	242	8½ cts.	24.42
	Peterkin	230	8½ cts.	23.22
11.	Cook's Improved	274	8½ cts.	$27.40
	Schley	266	8½ cts.	26.94
	Bennett's Selection	272	8½ cts.	26.93
	King (from Dallas)	259	8½ cts.	25.91
	Triumph	250	8½ cts.	25.00
	Toole	224	9¼ cts.	24.17
	Peterkin	202	8¼ cts.	20.32
	Rowden	172	8¼ cts.	17.32
12.	Bennett's Selection in all plats.	282	8½ cts.	$26.93

By comparing results, it will be seen that Excelsior, which was grown in but one acre, No. 1, made a return of $5.31 per acre more than Bennett's Selection yielded in that acre. Yellow Bloom appearing only once, also in Acre No. 1, outyielded Bennett's Selection by 38 cents.

Comparing all the eight acres in which Bennett's Selection and Triumph both appeared, we find Bennett's outyielded Triumph an average of $1.32 an acre. It is noted, however, that in five of the eight acres the money returns were only a few cents apart. This comparison is interesting, because most people who saw the two kinds growing side by side could not tell one from the other. Professor Bennett began some four years ago to select individual stalks and the best bolls from individual stalks of Triumph cotton, and to multiply from these seed. Both kinds appeared remarkably pure and true to type. It may be said, too, that Bennett's cotton turned out a materially higher percentage of lint, something not expected, and which may have been accidental. Had they turned out the same percentage of lint, the out-turns would not have been more than 50 cents an acre apart.

Comparing Bennett's and Early Prolific and Cook's Improved, in the same way, we find the former showing $1.71 an acre the advantage over Early Prolific, and $1.22 over Cook's Improved.

In several acres was grown cotton called Boyett's Gin Run Seed. These seed were supposed to have been improved seed three or four years before but had been handled since in the ordinary way. These yielded $2.22 an acre less than Bennett's seed and 46 cents less than Triumph; comparisons being made in each case where the two kinds were grown in the same acres.

In comparing Toole, which has been a high yielder at some of the Southeastern stations, we find Bennett's 70 cents an acre ahead of it. Toole, however, showed a better sample and was rated 3-4 of a cent higher in price. This may have been more or less accidental in running a hand gin that did not work at all well.

We find King $1.25 an acre ahead of Bennett's with one lot of seed, which was planted in two of the acres, and $1.02 behind Bennett's where some other King seed gotten from another source was planted in another acre.

Comparing Bennett's with Schley, another high yielding kind at some of the Southeastern stations, we find Bennett's with $2.95 an acre the advantage. Comparing Triumph and Schley in the acres where they appear together, Triumph is just five cents an acre ahead.

It will be seen that Rowden, quite a popular kind in Texas, yielded very low in every acre but one. This seed was obtained from an excellent seed grower and it seemed pure and true to a uniform type. Peterkin, an old standard kind that has averaged well at the Southeastern stations, here yielded low. These results must not be taken to mean that these kinds may not do better at another place, or here another year. One of the peculiarities of variety tests is the likelihood that the varieties will reverse themselves in performance. These two kinds appeared to be rather late, and more fruit was caught by the weevils.

The long staples did not average over half the yield of other kinds. Under our conditions, then, they would appear entirely unprofitable un-

less the long staple should bring nearly twice as much a pound as the short staples.

Large Bolls and Earliness.

The King perhaps did not outyield Bennett's, Triumph, and Cook's more than enough to pay the extra expense of picking small boll cotton like King. The Triumph and Bennett's Selection from Triumph were quite as early as any cotton in the test. In fact, they seemed to load up with bolls so as to check the growth of stalk a little earlier than any other kind, and nowhere grew as tall as other kinds. The large boll kinds did not open quite as early as some of the early small boll kinds.

It did not appear true, as is often held, that these large boll cottons are less damaged by storms. The Triumph and Bennett's particularly made many bolls close to the ground and have many on the ends of long limbs that hang down to the ground, and become quite as dirty as kinds that fall out of the bolls badly.

Percentage of lint.

All of our cotton this year showed low percentage yields of lint. The two kinds making the largest money returns in acre No. 1 turned out 32 1-4 and 31 1-2 per cent of lint respectively, both beating Bennett's Selection, which yielded 34.9 per cent and Triumph which yielded 33 1-3 per cent of lint. Early Prolific, which yielded quite high in two acres where tried and highest of all in acre No. 5, made this record on 30 per cent of lint.

Boyett's Gin Run Seed, which was first on one acre and averaged up well in yield, turned out 32 per cent of lint. King, which outyielded all kinds it came in competition with, made this record on 32.3 per cent of lint. So there appears this year no necessary connection between a high percentage of lint and the largest yield of lint to the acre.

The Best Kind of Cotton.

There is probably no one best kind of cotton for any particular place; certainly no best kind for all cotton districts. It is not certain to the writer that there are not in every neighborhood kinds that will outyield most of the so-called highly improved seed extensively sold, but this matter needs further investigation. Most variety tests of cotton up to this time have included only the kinds having names and claims of improvement. In almost every long list of kinds tested have been found yields varying from very poor to excellent. There is at least an indication in this year's work at this Station that common seed, grown, it may be, for many years near home, will show the same results, and give many big yielding kinds. It would probably pay better generally to find the best yielding kinds at home than to send a distance and pay higher prices for seed whose outcome will always be more or less uncertain.

Improving Seed.

It would seem from these results that Professor Bennett made a modest improvement in the yielding power of Triumph seed by some three years of rigid selection. It has seemed to the writer that many, if not most of the claims of certain, rapid, and revolutionary improvement in cotton, have been matters largely of imagination. Either this statement is true or deterioration has been equally certain and rapid; for the average yield of cotton has not materially increased in any state in fifty years, in spite of the expenditure of millions for seed, whose claims, if true in small part, would have resulted in revolutionizing the industry.

ADDENDA.

After this bulletin was printed it was learned from Prof. R. L. Bennett that the history of his work with corn and cotton here was not as accurately and fully stated as he would have desired, and he was therefore induced to make the following statement:

CORN SELECTIONS.

The Bennett selections of corn resulted from an experiment made to illustrate the producing power of different farmers seed corn collected at random over the state. Some of the collections were grown two years and some one year, but in each year the rows, which were ear-to-row method, were grown along side of the other kinds and varieties. At the end of the second year, 1907, some ears were selected from the best rows as a foundation for future experiments in breeding pure strains in isolated plots. The selections, not pure in the beginning were crossed by productive and unproductive kinds in adjacent rows, would naturally vary in their progeny, and that would account at least for some of the variation in the test of 1908, page 5.

COTTON SELECTION.

The Bennett selection from Triumph cotton (Triumph came from Boykin cotton) was one selection, one year only. The Bennett selection of one plant was propagated for three years to a large quantity of seed, which was planted in 1908. The exact extent of improvement of Bennett's selection can be determined only by comparing its yield with the Triumph cotton that furnished the selected plant. But as seed of the original was not at hand that test was not possible. The comparison therefore of the yield of the Bennett selection with other improved Triumph, as on page 13 and 14, shows only the extent of the average increase of the Bennett selection over Triumph cotton that claims improvement. The Bennett selection was made in studying characters of cotton in relation to early and rapid fruiting, particularly with reference to the general desirability of having large boll good staple cotton make an early crop equal to small boll short staple cotton with boll weevil present. The small boll short staple cotton seed, such as King, was at that time imported in thousands of carloads to Texas, and was found very unsatisfactory to Texas cotton growers and buyers. In making the study several leading varieties were grown, and the area of each was comparatively small, too small to insure with certainty that they contained the one plant of highest yielding power in each variety, and there is therefore, a probability that the full extent of improvement was not attained in the selection. But the work led to the discontinuance of the importation and general cultivation of small boll short stable cotton in Texas.

In cotton breeding it will be found that two cotton plants may have similar general characters and yet be very unequal in their producing power when measured by the yield of their progeny. There may be botan-

ical differences in the progeny of two plants, and no apparent difference in general appearance.

Sports, mutations and variations in cotton from crossing by insects and other causes make selection necessary for continued purity and maximum yielding power of any cotton. These variations also make opportunities for selection of new and perhaps improved strains. No very extravagant increase in yield of the best varieties of staple farm crops by breeding is at all probable. But any increase per acre for the entire farm and the improvement of various qualities and economic characters of crop plants are most desirable and valuable and can be accomplished by scientific breeding. The trouble at present is not so much with the best varieties as it is that farmers are mainly growing these varieties in a very impure form, a large part of the seed is so impure that the total yield is very much lower than it would be if the varieties were pure.

Thick and Thin Seeding.

Much advice has been given the farmer in years past to plant fewer seed—a peck or less to the acre in some cases being recommended. We planted in 1908 a half-bushel under as good conditions, it appeared, as could be had. Much replanting was necessary, and still the stand was not at all what it should have been. We believe it absolutely unsafe to risk less than a bushel of seed per acre, especially for early planting. This matter is further emphasized by the need of a thick, regular stand, whose importance is discussed below.

Spacing the Plants.

Much has been written in late years advising wide rows and thin stands of cotton in the rows, as a means of making good crops in spite of boll weevils. This advise was doubtless based on the well known fact that plenty of hot sun kills many weevils. The fact was overlooked that 15000 cotton plants per acre at the early stages of fruiting will each have space enough to put on about as much fruit as each of 5000 plants on an acre under thin spacing. Later when the plants have grown till the thin spaced plants occupy all the ground, the weevil is getting all the squares from both. All experiment station results in the Cotton States have uniformly shown that close rows and thick spacing make more cotton and earlier cotton than the wide rows and thin spacing—these results where there have been no boll weevils.

In rows 3½ feet apart in 1908 our cotton placed 12, 15, 18 inches made practically equal amounts, but all made decidedly more than the cotton spaced 24 inches, and made relatively more the first picking, showing the tendency toward earliness. These results were had with cotton that grew as large as Mississippi Delta cotton on fresh land.

Bearing on this question, the Louisiana Crop Pest Commission made in 1908, in a number of experiments at different places 25 per cent more cotton on 3 foot rows with cotton 10 inches in drill than they did with 4 foot rows and cotton 15 inches in the drill. The yield on the close spacing was 46 per cent more than with rows 6 feet wide and cotton 18 inches in the drill.

Late Planting.

Ten days apart in the time of planting Acre 1 and Acre 12 seemed to make no difference in the yield, although Acre 1 was not planted by ten days as early as some cotton in the neighborhood. Acre No. 13 was not planted till May 25th. It did not make 1-4 of a crop. It would appear that extreme earliness is not important, but reasonable earliness is absolutely necessary in order to make a fair crop.

Cutting Down Cotton.

About the middle of October two small pieces of cotton with their green bolls were cut down at the ground. This work closely followed picking, so as to knock out little cotton. The stalks were allowed to open up their bolls as compared with similar pieces left standing. The cut down stalks opened up about as much cotton and cotton of about as good quality as that left standing. There was no yellow cotton here the past season.

This was done to deprive boll weevils of green squares to breed in a month or more earlier than frost would destroy these squares, and at the

same time in the hope of saving all the cotton produced. This cutting with the right sort of machine need not cost more than 15 cents an acre, and two rows are laid over in every other middle. In one case the stalks were shocked or piled loosely, and in this way the cotton was not beaten out by the rains and was not much trashier than usual.

Farther east where there is always mulch yellow cotton, caused by frost, this plan, though only partially tried out as yet, it is believed, would increase the yield of good cotton that could be saved. There is scarcely any question, from the teachings of the entomologists, but that if the boll weevils could be entirely deprived of breeding places and food a month or six weeks earlier than usual, that only a very few could live over the long span necessary to bring them to cotton squares again next spring. In a district where the weevil may be expected to stop cotton from blooming August 10th, September 10th would find all bolls practically grown. Cutting down the stalks by September 15th, would, it is believed, not decrease the yield of cotton, and would destroy all squares to breed in just about two months earlier than a freeze might be expected to do it. Cotton planted April 15th might be expected to make a few squares not earlier than June 10th. September 15th to June 10th would make over 8 1-2 months that the weevil would have to live and yet have vitality enough to lay fertile eggs. It is incredible after such a lapse of time that there would be enough weevils left to do any considerable harm.

This plan, or any other requiring general cooperation, would have to have the force of law behind it and perhaps a direct reward ahead of it to get it carried out. Excellent as is believed to be the recommendation to burn the stalks after picking is finished, perhaps not 1 per cent of the people follow it. In San Patricio County, Texas, every farmer destroys the stalks, generally in Septembr or October, because all the land in cotton, some 3,000 acres, is owned by a corporation which requires this done. That area beats all the balance of the Cotton Belt in average yield; full three quarters of a bale per acre for a period of seven years having been made.

Farther east cotton is later opening, and any possible method of destruction after picking is finished will be less effective.

There may be quite a few districts, particularly where farms are small and labor plentiful for keeping up with picking, that the best thing to be done would be to require all cotton cut down at such time in fall as experience proves it has made practically all it will. More radical things are being done by force of law every day, in the destruction of fruit trees and nursery stock infested with insects or fungus diseases.