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CO-OPERATIVE FERTILIZER EXPERIMENTS
WITH COTTON IN 1897.

J. F. DUGGAR, Agriculturist.

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CO-OPERATIVE FERTILIZER EXPERIMENTS WITH COTTON IN 1897.

J. F. DUGGAR.

SUMMARY.

Under the direction of the Alabama Experiment Station fertilizer experiments with cotton, or "soil tests," were made in thirty localities in the State. The object was to learn the best fertilizers for the different classes of soil.

Two hundred pounds per acre of cottonseed meal was used to furnish nitrogen, 240 pounds of acid phosphate to supply phosphoric acid, and both one hundred and two hundred pounds of kainit to afford potash. These fertilizers were applied singly, in pairs, and all three together.

Of these experiments twenty-two afforded definite indications of the manurial needs of the soils on which they were made.

Phosphoric acid was most effective on eight soils, potash on four soils, and nitrogen on four soils; phosphoric acid and nitrogen were about equally beneficial in two experiments, and four soils stood greatly in need of all three fertilizer constituents—nitrogen, phosphoric acid and potash.

The experiments in which phosphoric acid was most effective were located near Tuskaloosa, Tuskaloosa county; Clanton, Chilton county; Sterrett, Shelby county; Town Creek, Lawrence county; Lumber Mills, Butler county; Prattville, Autauga county; Brewton, Escambia county; and Burnt Corn, Monroe county.

The experiments in which potash proved most effective

were located near Dothan, Henry county; Union Springs, Bullock county; Coatopa, Sumter county; and Naftel, Montgomery county.

The experiments in which nitrogen was most effective were located near Jackson, Clarke county; Perote, Bullock county; Greensboro, Hale county; and LeGrand, Montgomery county.

The experiments in which phosphoric acid, potash and nitrogen were all greatly advantageous were situated near Berneys, Talladega county; Thomaston, Marengo county; Rutledge, Crenshaw county; and Daphne, Baldwin county.

The experiments in which nitrogen and phosphoric acid were about equally beneficial, and potash of slight or no effect, were located near Cusseta, Chambers county, and Kaylor, Randolph county.

Fertilizer experiments with cotton were made in eight other localities, in which the results were not entirely conclusive.

The fertilizer that afforded the maximum net profit in the greatest number of localities was a complete fertilizer made up as follows:

200 pounds per acre cotton seed meal,

240 pounds per acre high grade acid phosphate, and

100 pounds per acre kainit.

This fertilizer mixture contained 2.59 per cent. of nitrogen, 7.75 per cent. of available phosphoric acid, and 2.93 per cent. of potash.

The season was generally dry, and rust or other leaf disease was widely prevalent and very destructive. Under these conditions, kainit greatly reduced the injury from leaf diseases in 61 per cent. of the experiments, or eight out of thirteen experiments of which complete reports were made. This does not imply so favorable an effect of kainit in seasons when weather conditions are normal, and when rust or blight is less widely prevalent.

OBJECTS AND METHODS OF THE EXPERIMENTS.

The soils of Alabama differ widely. Hence they require different fertilizers. For most profitable results the fertilizer must be suited to the soil. Misfits are frequent and costly, especially in a State spending several millions of dollars for commercial fertilizers. To decrease such losses is the object of the "soil tests," or local fertilizer experiments conducted under the direction of the Alabama Experiment Station by farmers in different soil belts.

To map the State, even roughly, according to the fertilizer requirements of the prevailing soils, must necessarily be the work of years. In locating these experiments the writer has been guided more by the geological map than by county lines.

The number of co-operative fertilizer experiments provided for in 1897 was thirty-six, from which 30 reports were received. Twenty of these reports give definite indications, and are discussed at length in this bulletin. The others, deemed inconclusive, are more briefly tabulated.

Small lots of carefully weighed and mixed fertilizers were supplied to each experimenter. Detailed instructions as to how to conduct the experiments, and blank forms for reporting results, were also furnished.

The following is the list of those who made the fertilizer tests in 1897 and reported results :

Name	Post Office	County	Page
Autrey, A.	Berneys	Talladega	85
Anderson, J. P.	Thomaston	Marengo	83
Blackstock, J. J.	McLendon	Russell	95
Borland, T. M.	Dothan	Henry	68
Ballard, J. L.	Jackson	Clarke	75
Craddock, J. B.	Abbeville	Henry	95
Daffin, E. J.	Tuscaloosa	Tuscaloosa	50
Daugette, Prof. C. W.	Jacksonville	Calhoun	96
Dykes, J. W.	Union Springs	Bullock	69
Funkey, F.	Tuscumbia	Colbert	96
Gordon, Dr. Jno.	Healing Springs ..	Washington	96
Hightower, W. T.	Perote	Bullock	77
Horn, C. D.	Coatopa	Sumter	71
Jarrett, J. W.	Sterrett	Shelby	52
Jones, T. K.	Greensboro	Hale	79
Logan, J. A.	Clanton	Chilton	54
McGregor, A. A.	Town Creek	Lawrence	56
McDonald, F. C.	Rutledge	Crenshaw	87
McLendon, J. R.	Naftel	Montgomery	73
Meadows, T. T.	Cusseta	Chambers	91
Robertson, J. T.	Legrand	Montgomery	81
Roundtree, F. M.	Evergreen	Conecuh	97
Sellers, Geo. O.	Lumber Mills	Butler	59
Smith, McQueen	Prattville	Autauga	62
Smith, G. W.	Brundidge	Pike	97
Terry, J. W.	Brewton	Escambia	63
Thomason, T. J.	Kaylor	Randolph	93
Valerio, A. M.	Daphne	Baldwin	89
Wilkinson, J. A.	Autaugaville	Autauga	97
Watkins, J. P.	Burnt Corn	Monroe	65

The directions sent required each plot to be one-eighth of an acre in area. Rows were $3\frac{1}{2}$ feet apart, and each experimenter was advised to so thin the cotton as to leave the same number of plants on each plot, preferably at distances of 18 inches between plants.

The directions stated that land employed for this test should be level and uniform, not manured in recent years, and not new-ground, or subject to overflow, and that it should be representative of large soil areas in its vicinity. The need of perfect uniformity of treatment for all plots (except as to kinds of fertilizers used) was emphasized.

Fertilizers were applied in the usual manner—that is, drilled, ridges afterwards being thrown up above the fertilizers.

Notes on the weather show that in most localities the season was abnormally dry, a circumstance which materially lessens the value of the results. A leaf disease, generally spoken of as rust or blight, was very prevalent, especially in the central and southern portions of the State.

THE FERTILIZERS USED.

The fertilizers used in this experiment cost, delivered in Auburn in less than carload lots, as follows:

	Per Ton.
Acid phosphate.....	\$ 11.00
Cottonseed meal.....	19.00
Kainit.....	13.75
Slaked lime.....	5.00

Prices naturally vary in different localities. Anyone can substitute the cost of fertilizers in his locality for the price given above. The above prices for high-grade acid phosphate (dissolved bone) and kainit are several dollars lower than the usual price. The manufacturers of the phosphate used, Edisto Phosphate Company, Charleston, S. C., supplied the Alabama Experiment Station with both phosphate and kainit at an extraordinarily low rate. A

part of the kainit was donated by the German Kali Works, New York City.

In each experiment two plots were left unfertilized, these being plots 3 and 8. The following table shows what kinds and amounts of fertilizers were used on certain plots; the number of pounds of nitrogen, phosphoric acid, and potash supplied per acre by each fertilizer mixture; and the percentage composition and cost per ton of each mixture, the latter being given in order that these mixtures may be readily compared with various brands of prepared guanos:

Pounds per acre of fertilizers, nitrogen, phosphoric acid, and potash used and composition of each mixture.

Plot No.	FERTILIZERS.		MIXTURE CONTAINS			Cost of mixture, per ton.
	Amount per acre.	KIND.	Nitrogen.	† Available phosphoric acid.	Potash.	
1	Lbs. 200	Cottonseed meal.....	Lbs. 13.58	Lbs. 5.76	Lbs. 3.54	\$19.00
		<i>In 100 lbs. c. s. meal.*</i>	6.79	2.88	1.77	
2	240	Acid phosphate.....	.....	36.12	.....	11.00
		<i>In 100 lbs. acid phos.</i>	.....	15.05	.....
4	200	Kainit.....	.....	.....	24.60	13.75
		<i>In 100 lbs. kainit.</i>	.....	.....	12.30	
5 {	200	Cottonseed meal.....	13.58	41.88	3.54	14.60
	240	Acid phosphate.....				
		<i>In 100 lbs. above mixt.</i>	3.09	9.52	.80	
6 {	200	Cottonseed meal.....	13.58	5.76	28.14	16.38
	200	Kainit.....				
		<i>In 100 lbs. above mixt.</i>	3.39	1.44	7.03	
7 {	240	Acid phosphate.....	.....	8.21	5.59	12.26
	200	Kainit.....				
		<i>In 100 lbs. above mixt.</i>	.....	.....	.....
9 {	200	Cottonseed meal.....	13.58	41.88	28.14	14.38
	240	Acid phosphate.....				
	200	Kainit.....				
		<i>In 100 lbs. above mixt.</i>	2.12	6.54	4.39	
10 {	200	Cottonseed meal.....	13.58	41.88	15.84	14.44
	240	Acid phosphate.....				
	100	Kainit.....				
		<i>In 100 lbs. above mixt.</i>	2.59	7.75	2.93	

* Average of many analyses.

† Counting all of the phosphoric acid in cottonseed meal as available.

Those farmers who are more accustomed to the word ammonia than to the term nitrogen, can change the figures for nitrogen into their ammonia equivalents by multiplying by $1\frac{3}{14}$.

Unless explained, the term "profit from fertilizers" as used in the following tables, might be misunderstood.

Profit or loss, as there used, is simply the difference between the value of the increase attributed to the fertilizer and the cost of the latter. To make this more exact, the careful reader may subtract from the apparent profit certain small items, which, because variable, could not be incorporated in the table—for example, cost of applying fertilizers and cost of picking and ginning the increase.

Again, the actual profit per acre from cotton culture may be greater or smaller than the "profit from fertilizer." When on the unfertilized plot cotton is produced at a loss of say \$3 per acre, and when the tables show, say \$10 as the profit from a certain fertilizer mixture, a part of this profit must go towards offsetting the loss that would have occurred without fertilizers, leaving the farmer in this case only \$7 in actual profit, although the fertilizer may have been beneficial to the extent of \$10 over and above its cost. On the other hand, when cotton is produced at a profit on unfertilized land, and when fertilizers also show a profit, the sum of these two items is very nearly the farmer's actual profit.

In determining the increase over the unfertilized plots, the yield of the fertilized plots, Nos. 4, 5, 6 and 7, is compared with both unfertilized plots lying on either side, giving to each unfertilized plot a weight inversely proportional to its distance from the plot under comparison. This method of comparison tends to compensate for variations in the fertility of the several plots.

It should be remembered that seasons, as well as soils, determine the effects of fertilizers, so that to be absolutely

reliable a fertilizer experiment should be repeated for several years on the same kind of soil.

GROUP I. PHOSPHORIC ACID MOST EFFECTIVE.

EXPERIMENT MADE BY E. J. DAFFIN, $2\frac{1}{2}$ MILES EAST OF TUSCALOOSA, TUSCALOOSA COUNTY.

The field had been cleared probably sixty or more years before. The experimenter does not describe the soil, but gives the following list of the trees constituting the original forest growth: Oak, pine, hickory, gum, beech, mulberry, sassafras, persimmon, cherry, poplar and ash.

The preceding crop was oats, which was preceded by two crops of corn.

Rust was present, and there was no difference in this respect between the different plots. The season was very dry, and the crop was made by August 5. The stand was almost perfect. "There were no outside rows."

A spot extending across plots 1, 2 3 and 4 was struck by lightning, but apparently the effect was not very great, for the injured plot that was not fertilized lacked only a few pounds of equaling the yield on the uninjured plot that was not fertilized.

Tuscaloosa experiment with cotton.

Plot No.	* FERTILIZER.		SEED COTTON		FINANCIAL RESULTS		
	Amount per acre.	KIND.	Yield per acre	Increase over unfertilized plots.	Value of increase at 2c per lb.	Cost of fertilizers per acre.	Profit from fertilizers.
	<i>Lbs</i>		<i>Lbs.</i>	<i>Lbs.</i>			<i>\$</i>
1	200	Cottonseed meal.....	648	56	\$1.12	\$1.90	-.79
2	240	Acid phosphate.....	896	304	6.08	1.32	4.76
3	00	No fertilizer.....	592				
4	200	Kainit.....	696	101	2.02	1.38	.64
5	200	Cottonseed meal.....	1,064	466	9.32	3.22	6.10
	240	Acid phosphate.....					
6	200	Cottonseed meal.....	904	303	6.06	3.28	2.78
	200	Kainit.....					
7	240	Acid phosphate.....	1,016	413	8.26	2.70	5.56
	200	Kainit.....					
8	00	No fertilizer.....	608				
9	200	Cottonseed meal.....	1,168	560	11.20	4.60	6.60
	240	Acid phosphate.....					
	200	Kainit.....	1,168	560	11.20	3.90	7.30
10	240	Acid phosphate.....					
	100	Kainit.....					

Increase of seed cotton per acre when cottonseed meal was added:

To unfertilized plot..... 56 lbs.
 To acid phosphate plot.....162 "
 To kainit plot.....202 "
 To acid phosphate and kainit plot.....147 "

Average increase with cottonseed meal.....142 "

Increase of seed cotton per acre when acid phosphate was added:

To unfertilized plot.....304 lbs..
 To cottonseed meal plot....362 "
 To kainit plot360 "
 To cottonseed meal and kainit plot.....257 "

Average increase with acid phosphate321 "

Increase of seed cotton per acre when kainit was added:

To unfertilized plot.....	101 lbs
To Cottonseed meal plot.....	247 "
To acid phosphate plot.....	109 "
To cottonseed meal and acid phos. plot....	94 "

Average increase with kainit.....138 "

Phosphoric acid was the fertilizer constituent most urgently needed by this soil. Nitrogen was moderately effective. The most profitable fertilizer was a mixture of 200 pounds per acre of cottonseed meal, 240 pounds of acid phosphate and 100 pounds of kainit. The favorable effect of acid phosphate on the soil in this vicinity was shown in 1889 in an experiment made by Mr. A. V. Albright, of Tuscaloosa county. (See Bul. 12 of this station.)

EXPERIMENT MADE BY J. W. JARRETT, $\frac{1}{2}$ MILE SOUTH OF STERRETT, SHELBY COUNTY.

Soil gray ; very shallow ; slaty subsoil.

This field was fresh land, cleared only three years before, and had produced only corn prior to the time of this experiment. The soil is described as good cotton land, but as not very retentive of either water or fertilizers. There was no rust. The weather was dry.

Sterrett experiment with cotton.

Plot No.	FERTILIZERS.		Per cent of crop at first picking	SEED COTTON		FINANCIAL RESULTS		
	Amount per acre.	KIND.		Yield per acre.	Increase over unfertilized plots.	Value of increase at 2c per lb.	Cost of fertilizers per acre.	Profit from fertilizers.
	<i>Lbs.</i>			<i>Lbs.</i>	<i>Lbs.</i>			\$
1	200	Cottonseed meal.....	35	1,080	40	\$0.80	\$1.90	-1.10
2	240	Acid phosphate.....	41	1,448	408	8.16	1.32	6.84
3	00	No fertilizer.....	30	1,040	.....	.....	.....	.....
4	200	Kainit.....	30	1,216	118	2.36	1.38	.98
5	200	Cottonseed meal....	36	1,688	533	10.66	3.22	7.22
	240	Acid phosphate.....						
6	200	Cottonseed meal....	25	1,200	-13	-.26	3.28	.....
	200	Kainit.....						
7	240	Acid phosphate.....	34	1,520	249	4.98	2.70	2.28
	200	Kainit.....						
8	00	No fertilizer.....	27	1,328	.....	.....	.....	.....
	200	Cottonseed meal....	24	1,720	392	7.84	4.60	3.24
9	240	Acid phosphate....						
	200	Kainit.....	24	1,512	184	3.68	3.90	-.22
10	200	Cottonseed meal ...						
	240	Acid phosphate.....						
	100	Kainit.....						

Increase of seed cotton per acre when cottonseed meal was added:

To unfertilized plot	40 lbs.
To acid phosphate plot	125 "
To kainit plot	- 131 "
To acid phosphate and kainit plot	143 "

Average increase with cottonseed meal..... 44 "

Increase of seed cotton per acre when acid phosphate was added:

To unfertilized plot	408 lbs.
To cottonseed meal plot.....	493 "
To kainit plot	131 "
To cottonseed meal and kainit plot.....	405 "

Average increase with acid phosphate..... 359 "

Increase of seed cotton per acre when kainit was added:

To unfertilized plot	118 lbs.
To cottonseed meal plot.....	— 53 ”
To acid phosphate plot	—159 ”
To cottonseed meal and acid phos. plot—	141 ”

Average decrease with kainit..... 59 ”

The chief need of this recently cleared land was for acid phosphate. As usual, on fresh land cottonseed meal was not very effective. Kainit was not needed. The most profitable fertilizer was the mixture of acid phosphate and cottonseed meal, which was only a few cents ahead of acid phosphate used alone.

These results accord with those obtained in a two years' test conducted by Mr. J. W. Pitts, Creswell Station, Shelby county, in showing a special need for phosphoric acid and no increase from potash.

EXPERIMENT MADE BY J. A. LOGAN, CLANTON, CHILTON COUNTY.

Gray sandy soil ; pale red subsoil.

The field used was cleared of the original growth of pine and oak ten or fifteen years ago. Corn was the crop in 1895 and 1896.

The report does not indicate whether the yields were seriously affected by rust, although this was present on some plots.

Clanton experiment with cotton.

Plot No.	FERTILIZERS.		SEED COTTON		FINANCIAL RESULTS		
	Amount per acre.	KIND.	Yield per acre.	Increase over unfertilized plots.	Value of increase at 2c per lb.	Cost of fertilizers per acre.	Profit from fertilizers.
1	Lbs. 200	Cottonseed meal.....	Lbs. 432	112	\$2.24	\$1.90	\$0.34
2	240	Acid phosphate.....	584	264	5.28	1.32	3.96
3	00	No fertilizer.....	320	.....	.....	.....	.....
4	200	Kainit	496	169	3.38	1.38	2.00
5	200	Cottonseed meal.....	912	578	11.56	3.22	8.34
	240	Acid phosphate.....					
6	200	Cottonseed meal.....	680	338	6.76	3.28	3.48
	200	Kainit.....					
7	240	Acid phosphate.....	1,084	735	14.70	2.70	12.00
	200	Kainit.....					
8	00	No fertilizer.....	356	.....	.....	.....	.....
9	200	Cottonseed meal.....	1,032	676	13.52	4.60	8.90
	240	Acid phosphate.....					
10	200	Kainit	1,112	756	15.12	3.90	11.20
	200	Cottonseed meal.....					
	240	Acid phosphate.....					
	100	Kainit					

Increase of seed cotton per acre when cottonseed meal was added:

To unfertilized plot 112 lbs.
 To acid phosphate plot 314 "
 To kainit plot 169 "
 To acid phosphate and kainit plot — 59 "

Average increase with cottonseed meal..... 134 "

Increase of seed cotton per acre when acid phosphate was added:

To unfertilized plot 264 lbs.
 To cottonseed meal plot..... 466 "
 To kainit plot 566 "
 To cottonseed meal and kainit plot..... 338 "

Average increase with acid phosphate..... 409 "

Increase of seed cotton per acre when kainit was added:

To unfertilized plot	169 lbs.
To cottonseed meal plot.....	226 "
To acid phosphate plot	471 "
To cottonseed meal and acid phos. plot....	98 "

Average increase with kainit.....241 "

The chief need of this soil was for phosphoric acid. Potash ranked second in efficiency. To a less extent the yield was increased by nitrogen. The most profitable fertilizers were the mixtures of cottonseed meal, acid phosphate and kainit; apparently 100 pounds per acre of kainit was more profitable than 200 pounds.

Mr. Logan conducted a fertilizer test on cotton in 1891 and again in 1892. All three tests agree in showing that phosphoric acid is more urgently needed than any other fertilizing ingredient. They all agree further in showing that the soil of that vicinity responds moderately to nitrogen. They disagree in regard to the effects of potash, muriate of potash in the two earlier experiments proving useless, and kainit in the present experiment proving decidedly beneficial and profitable.

This difference is not strange in view of the fact that the seasons were not alike; that different potash salts were employed, and that almost certainly different fields were used. Apparently the land which in 1897 showed a need of potash was in poorer condition than the field used in the two earlier tests. Apparently a fertilizer for the soils of this locality should consist chiefly of acid phosphate.

EXPERIMENT MADE BY A. A. MCGREGOR, 2½ MILES SOUTHWEST OF TOWN CREEK, LAWRENCE COUNTY.

Yellowish red soil, 6 inches deep; subsoil red.

This field had been in cultivation at least 70 years. Original forest growth was red oak, post oak, black jack oak and hickory. The preceding crop was cotton, which was

immediately preceded by two corn crops. From many valuable notes recorded by the experimenter the following extract is taken as explanatory of the results on plots 7, 9 and 10: "Aug. 4.—No. 10 not fired or matured so much as No. 9 or No. 7. . . . Sept. 20.—All plots containing phosphate have suffered from drought, but plots with phosphate and kainit more than others. There was no rust, but considerable loss from the shedding of forms. Leaves were shed about the middle of September, which was due not to maturity, but to drought and heat."

The number of plants on each eighth-acre plot was as follows: 1131 on plot 1, 1151 on plot 2, 1037 on plot 3, 1042 on plot 4, 1143 on plot 5, 1126 on plot 6, 1105 on plot 7, 1013 on plot 8, 988 on plot 9, and 931 on plot 10.

The actual yields, independent of the number of plants per plot, constitute the basis for the following table. In studying these results to learn whether the yields were greatly affected by variations in the stand, a calculation was made of the theoretical yields on the basis of a perfectly uniform stand. An analysis of these "corrected yields" pointed to the same general conclusions as those drawn from the actual yields. That is to say, the average increase due to acid phosphate was 329 pounds on the basis of actual yields and 332 pounds on the basis of yields corrected to allow for variations in the stand. Likewise the average increase on four plots attributable to cottonseed meal was 168 pounds by actual yields and 177 pounds by "corrected" yields. For kainit the average increase on four plots was 39 pounds, reckoned on actual yields, and 81 pounds on a basis of a uniform stand.

Town Creek experiment with cotton.

Plot No.	FERTILIZERS.		Per cent. of crop at first picking, Sept. 4.	SEED COTTON		FINANCIAL RESULTS		
	Amount per acre.	KIND.		Yield, per acre.	Increase over unfertilized plots.	Value of increase at 2c. per lb.	Cost of fertilizing, per acre.	Profit from fertilizers.
	<i>Lbs.</i>			<i>Lbs.</i>	<i>Lbs.</i>			
1	200	Cottonseed meal.....	18	756	96	\$1.92	\$1.90	\$0.02
2	240	Acid phosphate.....	20	1,036	376	7.52	1.32	6.20
3	00	No fertilizer.....	6	660	.....	.....	.....	.....
4	200	Kainit.....	8	796	168	3.36	1.38	1.98
5	200	Cottonseed meal.....	27	1,248	652	13.04	3.22	9.82
	240	Acid phosphate.....						
6	200	Cottonseed meal.....	17	844	280	5.60	3.28	2.32
	200	Kainit.....						
7	240	Acid phosphate.....	23	854	322	6.44	2.70	3.74
	200	Kainit.....						
8	00	No fertilizer.....	6	500	.....	.....	.....	.....
9	200	Cottonseed meal.....	26	1,008	508	10.16	4.60	5.56
	240	Acid phosphate.....						
	200	Kainit.....						
10	200	Cottonseed meal.....	26	1,144	644	12.88	3.90	8.98
	240	Acid phosphate.....						
	100	Kainit.....						

Increase of seed cotton per acre when cottonseed meal was added:

To unfertilized plot 96 lbs.
 To acid phosphate plot 276 "
 To kainit plot 112 "
 To acid phosphate and kainit plot 186 "

Average increase with cottonseed meal 168 "

Increase of seed cotton per acre when acid phosphate was added:

To unfertilized plot 376 lbs.
 To cottonseed meal plot..... 556 "
 To kainit plot 154 "
 To cottonseed meal and kainit plot..... 228 "

Average increase with acid phosphate 329 "

Increase of seed cotton per acre when kainit was added:

To unfertilized plot	168 lbs.
To cottonseed meal plot	184 "
To acid phosphate plot	— 54 "
To cottonseed meal and acid phos. plot.	— 144 "

Average increase with kainit 39 "

The chief need of this soil was for phosphoric acid. Nitrogen was decidedly more beneficial than kainit.

These results accord with Mr. McGregor's experiment in 1896.

The greatest profit from fertilizers, \$9.82 per acre, was obtained by a mixture of acid phosphate and cottonseed meal.

EXPERIMENT MADE BY GEORGE O. SELLERS, LUMBER MILL,
BUTLER COUNTY.

Gray, sandy soil, 10 inches deep; red clay subsoil.

This field, on which the original growth had been yellow pine and blackjack oak, had been cleared eleven years before.

The season was dry until the middle of August, when there occurred ten days of rainy weather, favoring rust, which caused shedding of leaves on all plots where no kainit was used. The stand is reported as uniform.

Lumber Mills experiment with cotton.

Plot No.	FERTILIZERS.		Per cent. of crop at first picking August 30.	SEED COTTON		FINANCIAL RESULTS		
	Amount per acre.	KIND		Yield per acre.	Increase over unfertilized plots.	Value of increase at 2c per lb.	Cost of fertilizers per acre.	Profit from fertilizers.
	<i>Lbs.</i>			<i>Lbs.</i>	<i>Lbs.</i>			
1	200	Cottonseed meal.....	80	520	152	\$3.04	\$1.90	\$1.14
2	240	Acid phosphate.....	85	600	232	4.64	1.32	2.32
3	00	No fertilizer.....	63	368	.....	.....	.....	.....
4	200	Kainit	67	568	184	3.68	1.38	2.30
5	200	Cottonseed meal....	95	784	384	7.68	3.22	4.46
	240	Acid phosphate.....						
6	200	Cottonseed meal....	69	712	296	5.92	3.28	2.64
	200	Kainit						
7	240	Acid phosphate.....	79	784	352	7.04	2.70	4.34
	200	Kainit						
8	00	No fertilizer.....	61	448	.....	.....	.....	.....
9	200	Cottonseed meal....	87	856	408	8.16	4.60	3.56
	240	Acid phosphate.....						
	200	Kainit						
	200	Cottonseed meal....						
	240	Acid phosphate.....	87	800	352	7.04	3.90	3.14
	100	Kainit						

Increase of seed cotton per acre when cottonseed meal was added:

To unfertilized plot 152 lbs.
 To acid phosphate plot 152 "
 To kainit plot 112 "
 To acid phosphate and kainit plot 56 "

Average increase with cottonseed meal..... 116 "

Increase of seed cotton per acre when acid phosphate was added:

To unfertilized plot..... 232 lbs.
 To cottonseed meal plot..... 232 "
 To kainit plot 168 "
 To cottonseed meal and kainit plot..... 112 "

Average increase with acid phosphate 186 "

Increase of seed cotton per acre when kainit was added:

To unfertilized plot	184 lbs.
To cottonseed meal plot	144 "
To acid phosphate plot	120 "
To cottonseed meal and acid phos. plot	24 "

Average increase with kainit 108 "

Acid phosphate was most effective. Both cottonseed meal and kainit, although not equalling acid phosphate, were beneficial. The benefit from kainit in 1897 is not necessarily an indication that this soil is deficient in potash, since at least a large part of this benefit seems due to the rust-restraining tendency of this fertilizer.

EXPERIMENT MADE BY MESSRS. McQUEEN SMITH AND B. W.
GRESHAM, ON THE FARM OF THE FORMER NEAR
PRATTVILLE, AUTAUGA COUNTY, ALA.

Soil, red clay or loam.

This test was made on nearly level upland which had been in cultivation for perhaps 50 years. The original growth was pine, oak, hickory and chestnut.

Prattville experiment with cotton.

Plot No.	FERTILIZERS.		SEED COTTON		FINANCIAL RESULTS		
	Amount per acre.	KIND.	Yield per acre.	Increase over unfertilized plots.	Value of increase at 2c per lb.	Cost of fertilizers per acre.	Profit from fertilizers.
	Lbs.		Lbs.	Lbs.	\$		\$
1	200	Cottonseed meal.....	160	—8	.16	\$1.90	—2.06
2	240	Acid phosphate.....	360	192	3.84	1.32	2.52
3	00	No fertilizer.....	168	.....	.....	.....	.....
4	200	Kainit.....	384	197	3.94	1.38	2.56
5	200	Cottonseed meal.....	520	314	6.28	3.22	3.06
	240	Acid phosphate.....					
6	200	Cottonseed meal.....	480	155	3.10	3.28	— .18
	200	Kainit.....					
7	240	Acid phosphate.....	592	348	6.96	2.70	4.26
	200	Kainit.....					
8	00	No fertilizer.....	264	.....	.....	.....	.....
9	200	Cottonseed meal.....	616	352	7.04	4.60	2.44
	240	Acid phosphate.....					
10	200	Cottonseed meal.....	664	400	8.00	3.90	4.10
	240	Acid phosphate.....					
	100	Kainit.....					

Increase of seed cotton per acre when cottonseed meal was added:

To unfertilized plot — 8 lbs.
 To acid phosphate plot 122 "
 To kainit plot — 42 "
 To acid phosphate and kainit plot 4 "

Average increase with cottonseed meal 19 "

Increase of seed cotton per acre when acid phosphate was added:

To unfertilized plot	192 lbs.
To cottonseed meal plot.....	322 "
To kainit plot	151 "
To cottonseed meal and kainit plot.....	197 "

Average increase with acid phosphate 216 "

Increase of seed cotton per acre when kainit was added:

To unfertilized plot	197 lbs.
To cottonseed meal plot.....	163 "
To acid phosphate plot	156 "
To cottonseed meal and acid phos. plot....	38 "

Average increase with kainit..... 139 "

The chief need of this soil was for acid phosphate. Kainit in this unfavorable season was moderately effective. The cowpeas grown between the rows of corn on this field in 1896 apparently furnished enough nitrogen; at any rate, cottonseed meal was not decidedly beneficial in 1897.

The largest profit, \$4.26 per acre, was obtained by the use of a mixture of acid phosphate and kainit, this, with the peavines of the preceding year, forming practically a complete fertilizer.

EXPERIMENT MADE BY J. W. TERRY, BREWTON, ESCAMBIA COUNTY.

Gray soil; clay subsoil.

Pine, the original growth, was removed twelve years ago. The preceding crop was oats, followed by cowpeas. Corn occupied the field in 1895, and sugar cane in 1894.

"The very hot and dry weather after the rain in July caused all the fertilized plots to shed bottom leaves. Plots 5, 6, 7, 9 and 10 never recovered from a storm in July."

Brewton experiment with cotton.

Plot No.	FERTILIZERS.		SEED COTTON		FINANCIAL RESULTS		
	Amount per acre.	KIND.	Yield per acre.	Increase over unfertilized plots.	Value of increase at 2c per lb.	Cost of fertilizers per acre.	Profit from fertilizers.
1	200	Cottonseed meal.....	808	286	\$5.72	\$1.90	\$3.82
2	240	Acid phosphate.....	864	352	7.04	1.32	5.72
3	00	No fertilizer.....	512	.....	.....	.....	.....
4	200	Kainit	712	172	3.44	1.38	2.06
5	200	Cottonseed meal.....	704	157	3.14	3.22	— .08
	240	Acid phosphate.....					
6	200	Cottonseed meal.....	792	227	4.54	3.28	1.26
	200	Kainit					
7	240	Acid phosphate.....	816	234	4.68	2.70	1.98
	200	Kainit					
8	00	No fertilizer.....	600	.....	.....	.....	.....
9	200	Cottonseed meal.....	864	264	5.28	4.60	.68
	240	Acid phosphate.....					
	200	Kainit					
10	200	Cottonseed meal.....	880	280	5.60	3.90	1.70
	240	Acid phosphate.....					
	100	Kainit					

Increase of seed cotton per acre when cottonseed meal was added:

To unfertilized plot.....	286 lbs.
To acid phosphate plot	— 195 "
To kainit plot	55 "
To acid phosphate and kainit plot	30 "

Average increase with cottonseed meal..... 93 "

Increase of seed cotton per acre when acid phosphate was added:

To unfertilized plot	353 lbs.
To cottonseed meal plot.....	129 "
To kainit plot	62 "
To cottonseed meal and kainit plot.....	37 "

Average increase with acid phosphate 145 "

Increase of seed cotton per acre when kainit was added:

To unfertilized plot	172 lbs.
To cottonseed meal plot.....	—59 "
To acid phosphate plot	—118 "
To cottonseed meal and acid phos. plot....	107 "

Average increase with kainit 26 "

Unfortunately at the date when the report was forwarded to Auburn some cotton still remained unpicked on plots 1, 2, 4 and 5, estimated roughly by the experimenter at about 10 pounds on each of these eighth-acre plots. The table does not include the cotton on these four plots opening at that late date. As recorded, the figures show that the greatest increase in yield is attributed to acid phosphate.

Cottonseed meal increased the yield, in spite of the fact that the preceding crop of cowpeas had already contributed to the supply of nitrogen in the soil. Kainit was unprofitable.

This experiment by no means indicates that under normal weather conditions and on land not recently in cowpeas acid phosphate and cottonseed meal could be used singly to greater advantage than in combination. We should expect a mixed fertilizer to give best results on this pine woods land.

EXPERIMENT MADE BY J. P. AND J. C. WATKINS, 2 MILES
NORTH OF BURNT CORN, MONROE COUNTY.

Gray, sandy and rocky soil; red clay subsoil.

The field on which this test was made had been in cultivation about thirty years. The original forest growth is reported as pine, oak and sweetgum. No note is made of injury from rust.

Burnt Corn experiment with cotton.

Plot No.	FERTILIZERS.		Per cent. of crop at first picking, Sept. 4.	SEED COTTON FINANCIAL RESULTS				
	Amount per acre.	KIND.		Yield per acre.	Increase over unfertilized plots.	Value of increase at 2c per lb.	Cost of fertilizers per acre.	Profit from fertilizers.
1	Lbs. 200	Cottonseed meal.....	12	Lbs. 480	Lbs. 40	\$0.80	\$1.90	\$ 1.10
2	240	Acid phosphate.....	7	648	208	4.16	1.32	2.84
3	00	No fertilizer.....	5	440				
4	200	Kainit.....	5	448	51	1.02	1.38	— .36
5	200	Cottonseed meal.....	53	656	302	6.04	3.22	2.82
	240	Acid phosphate.....						
6	200	Cottonseed meal.....	18	600	290	5.80	3.28	2.52
	200	Kainit.....						
7	240	Acid phosphate.....	6	528	261	5.22	2.70	2.52
	200	Kainit.....						
8	00	No fertilizer.....	7	224				
9	200	Cottonseed meal.....	21	768	434	8.68	4.60	4.08
	240	Acid phosphate.....						
	200	Kainit.....						
10	200	Cottonseed meal.....	31	664	330	6.60	3.90	2.70
	240	Acid phosphate.....						
	100	Kainit.....						

Increase of seed cotton per acre when cottonseed meal was added:

To unfertilized plot	40 lbs.
To acid phosphate plot	94 "
To kainit plot	239 "
To acid phosphate and kainit plot	132 "

Average increase with cottonseed meal 126 "

Increase of seed cotton per acre when acid phosphate was added:

To unfertilized plot	208 lbs.
To cottonseed meal plot.....	262 "
To kainit plot	210 "
To cottonseed meal and kainit plot.....	144 "

Average increase with acid phosphate..... 206 "

Increase of seed cotton per acre when kainit was added:

To unfertilized plot	51 lbs.
To cottonseed meal plot.....	250 "
To acid phosphate plot	53 "
To cottonseed meal and acid phos. plot....	132 "

Average increase with kainit.....122 "

In spite of the wide variation in the yields of the two fertilized plots, there is sufficient evidence to prove that this soil was especially deficient in phosphoric acid, and that nitrogen and potash were also needed. In 1896, when the yield on the unfertilized plots was only about half that of 1897, nitrogen afforded the greatest increase in yield.

GROUP II. POTASH MOST EFFECTIVE.

EXPERIMENT MADE BY T. M. BORLAND, DOTHAN, HENRY
COUNTY.

Soil sandy ; subsoil clay.

This piney woods field had been in cultivation for eight years, corn and cotton alternating.

Cotton on all plots died prematurely, which the experimenter attributed, not to "rust," but to unusually hot weather in the latter part of July.

Dothan experiment with fertilizers.

Plot No.	FERTILIZERS.		Per cent. of crop at first picking.	SEED COTTON		FINANCIAL RESULTS		
	Amount per acre.	KIND.		Yield per acre.	Increase over unfertilized plots.	Value of increase at 2c per lb.	Cost of fertilizers per acre.	Profit from fertilizers.
	Lbs.			Lbs.	Lbs.			\$
1	200	Cottonseed meal.....	59	440	80	\$1.60	\$1.90	— .30
2	240	Acid phosphate.....	65	512	152	3.04	1.32	1.72
3	00	No fertilizer.....	49	360	.....	.....	.....	.....
4	200	Kainit.....	39	592	234	4.64	1.38	3.26
5	200	Cottonseed meal....	75	480	113	2.26	1.23	1.03
	240	Acid phosphate.....						
6	200	Cottonseed meal....	51	680	325	6.50	3.28	3.22
	200	Kainit.....						
7	240	Acid phosphate.....	68	720	366	7.32	2.70	4.62
	200	Kainit.....						
8	00	No fertilizer.....	45	352	.....	.....	.....	.....
9	200	Cottonseed meal....	72	848	486	9.72	4.60	5.12
	240	Acid phosphate.....						
10	200	Kainit.....	81	776	423	8.46	3.90	4.56
	240	Acid phosphate.....						
	100	Kainit.....						

Increase of seed cotton per acre when cottonseed meal was added:

To unfertilized plot	80 lbs.
To acid phosphate plot	—39 "
To kainit plot	91 "
To acid phosphate and kainit plot	120 "

Average increase with cottonseed meal..... 63 "

Increase of seed cotton per acre when acid phosphate was added:

To unfertilized plot	152 lbs.
To cottonseed meal plot.....	33 "
To kainit plot	132 "
To cottonseed meal and kainit plot.....	161 "

Average increase with acid phosphate..... 120 "

Increase of seed cotton per acre when kainit was added:

To unfertilized plot	234 lbs.
To cottonseed meal plot.....	245 "
To acid phosphate plot	214 "
To cottonseed meal and acid phos. plot....	373 "

Average increase with kainit..... 267 "

In this test kainit stands ahead of the other two fertilizers in effectiveness, a large and rather uniform increase in yield occurring on every plot where kainit was used. In a complete fertilizer 200 pounds per acre of kainit proved better than 100 pounds.

The fact that acid phosphate was only moderately effective, and that cottonseed meal was only slightly beneficial, is probably due to the extremely unfavorable season in July and August.

It remains uncertain whether the favorable effects of kainit are here due to (1) a deficiency of potash in the soil; (2) to the tendency of this fertilizer to increase the water-holding power of the soil, or (3) to the rust-restraining tendency of kainit. The experimenter reported no marked difference in amount of rust on kainit plots and those receiving no kainit.

EXPERIMENT MADE BY J. W. DYKES, THREE AND A HALF MILES WEST OF UNION SPRINGS, BULLOCK COUNTY.

Red soil, 5 inches deep; subsoil red clay.

The land had been in cultivation thirteen years, cotton and corn alternating. The crop in 1896 was cotton. The original forest growth was hickory, post oak, sweetgum, etc. This soil is reported as especially liable to "blight and rust," and these leaf diseases were very destructive in 1897, especially on plots 1, 2, 3, 5 and 8, the only plots on which no kainit was used.

Replying to a question relative to the extent of the shedding on the different plots, the experimenter writes: "The

extreme heat of the last part of June caused all plots to shed. Plots where no kainit was used shed most, especially plots 1, 2 and 5."

Union Springs experiment with cotton.

Plot No.	FERTILIZERS.		Per cent. of crop at first picking.	SEED COTTON		FINANCIAL RESULTS		
	Amount per acre.	KIND.		Yield per acre.	Increase over unfertilized plots.	Value of increase at 2c per lb.	Cost of fertilizers per acre.	Profit from fertilizers.
	<i>Lbs.</i>			<i>Lbs.</i>	<i>Lbs.</i>			
1	200	Cottonseed meal.....	78	648	128	\$2.56	\$1.90	\$0.66
2	240	Acid phosphate.....	94	664	144	2.88	1.32	1.56
3	00	No fertilizer.....	97	520	.....	.....	.....	.....
4	200	Kainit.....	77	812	294	5.88	1.38	4.50
5	200	Cottonseed meal.....	86	704	187	3.74	3.22	.52
	240	Acid phosphate.....						
6	200	Cottonseed meal.....	78	688	173	3.46	3.28	.18
	200	Kainit.....						
7	240	Acid phosphate.....	85	704	290	5.80	2.70	3.10
	200	Kainit.....						
8	00	No fertilizer.....	95	512	.....	.....	.....	.....
9	200	Cottonseed meal.....	81	808	296	5.92	4.60	1.32
	240	Acid phosphate.....						
	200	Kainit.....						
10	200	Cottonseed meal.....	91	784	272	5.44	3.90	1.54
	240	Acid phosphate.....						
	100	Kainit.....						

Increase of seed cotton per acre when cottonseed meal was added:

To unfertilized plot 128 lbs.
 To acid phosphate plot 43 "
 To kainit plot -121 "
 To acid phosphate and kainit plot 6 "

Average increase with cottonseed meal 14 "

Increase of seed cotton per acre when acid phosphate was added:

To unfertilized plot	144 lbs.
To cottonseed meal plot.....	59 "
To kainit plot	—4 "
To cottonseed meal and kainit plot.....	123 "

Average increase with acid phosphate..... 81 "

Increase of seed cotton per acre when kainit was added:

To unfertilized plot	294 lbs.
To cottonseed meal plot.....	45 "
To acid phosphate plot	146 "
To cottonseed meal and acid phos. plot....	109 "

Average increase with kainit..... 159 "

The results for 1897 show that the soil needed kainit chiefly as a check on rust.

The largest profit was obtained where kainit alone was used, a mixture of kainit and acid phosphate standing second in this respect. In a complete fertilizer 100 pounds of kainit afforded nearly as large a yield and a slightly greater profit than double that quantity.

EXPERIMENT MADE BY C. D. HORN, COATOPA, SUMTER COUNTY.

Yellowish, sandy soil, with red subsoil at a depth of 3 inches.

This field had been in cultivation for about forty years, almost continually in cotton, except one year, when corn and cowpeas were grown, and in 1896, when cowpeas and sweet potatoes both occupied portions of the field. The original growth was red oak and hickory, with occasionally a post oak.

On August 10th plants on all plots appeared to have died as the result of rust; but new leaves developed on every plot receiving kainit. (Plots 4, 6, 7, 9 and 10.)

The table gives yields based only on the September and

October pickings. Unfortunately the light November picking, which was at the rate of seventy pounds per acre, was mixed by laborers. Apparently the slight yield at the last picking would not have greatly changed the results here recorded.

Coatopa experiment with cotton.

Plot No.	FERTILIZERS.		SEED COTTON		FINANCIAL RESULTS		
	Amount per acre.	KIND.	Yield per acre.	Increase over unfertilized plots.	Value of increase at 2c per lb.	Cost of fertilizers per acre.	Profit from fertilizers.
	<i>Lbs.</i>		<i>Lbs.</i>	<i>Lbs.</i>			\$
1	200	Cottonseed meal.....	264	32	\$0.64	\$1.90	—1.26
2	240	Acid phosphate.....	400	104	2.08	1.32	.76
3	00	No fertilizer.....	296				
4	200	Kainit.....	496	200	4.00	1.38	2.62
5	200	Cottonseed meal.....	520	224	4.48	3.22	1.26
	240	Acid phosphate.....					
6	200	Cottonseed meal.....	648	352	7.04	3.28	3.76
	200	Kainit.....					
7	240	Acid phosphate.....	640	344	6.88	2.70	4.18
	200	Kainit.....					
8	00	No fertilizer.....	296				
9	200	Cottonseed meal.....	760	464	9.28	4.60	4.68
	240	Acid phosphate.....					
10	200	Kainit.....	688	392	7.84	3.90	3.94
	240	Acid phosphate.....					
	100	Kainit.....					

Increase of seed cotton per acre when cottonseed meal was added:

To unfertilized plot	32 lbs.
To acid phosphate plot	120 "
To kainit plot	152 "
To acid phosphate and kainit plot.....	120 "

Average increase with cottonseed meal..... 106 "

Increase of seed cotton per acre when acid phosphate was added:-

To unfertilized plot	104 lbs.
To cottonseed meal plot.....	192 "
To kainit plot	144 "
To cottonseed meal and kainit plot.....	112 "

Average increase with cottonseed meal.....138 "

Increase of seed cotton per acre when kainit was added:

To unfertilized plot	200 lbs.
To cottonseed meal plot.....	220 "
To acid phosphate plot	240 "
To cottonseed meal and acid phos. plot....	240 "

Average increase with kainit.....225 "

All three of the usual fertilizer ingredients were needed. Applied singly there was a financial loss with all except kainit. The mixtures containing kainit were more effective than any other fertilizer. A complete fertilizer was most profitable, and the profit was greater with 200 pounds per acre of kainit than with 100 pounds.

EXPERIMENT MADE BY J. R. MCLENDON, NAFTEL, MONTGOMERY COUNTY.

Light, sandy soil; red clay subsoil.

The land had been cleared about forty years, and had been fertilized but twice during that time, once with commercial fertilizers and once with a crop of cowpea vines. The original growth was pine, red oak and hickory. The preceding crop was cowpeas. The season was extremely dry. The stand was defective.

Naftel experiment with cotton.

Plot No.	FERTILIZERS.		Per cent. of crop at first picking, Sept. 22.	SEED COTTON		FINANCIAL RESULTS		
	Amount per acre.	KIND.		Yield per acre.	Increase over unfertilized plots.	Value of increase at 2c per lb.	Cost of fertilizers per acre.	Profit from fertilizers.
	Lbs.			Lbs.	Lbs.			\$
1	200	Cottonseed meal.....	79	152	8	\$0.16	\$1.90	-1.74
2	240	Acid phosphate.....	76	200	56	1.12	1.32	-.20
3	00	No fertilizer.....	77	144	.....	.....	.....	.....
4	200	Kainit.....	88	360	215	.30	1.38	-1.08
5	200	Cottonseed meal.....	88	344	198	3.96	3.22	.74
	240	Acid phosphate.....						
6	200	Cottonseed meal.....	84	456	310	6.20	3.28	2.92
	200	Kainit.....						
7	240	Acid phosphate.....	92	408	261	5.22	2.70	2.52
	200	Kainit.....						
8	00	No fertilizer.....	79	148	.....	.....	.....	.....
9	200	Cottonseed meal.....	87	616	468	9.96	4.60	4.76
	240	Acid phosphate.....						
	200	Kainit.....						
10	200	Cottonseed meal.....	88	488	340	6.80	3.90	2.90
	240	Acid phosphate.....						
	100	Kainit.....						

Increase of seed cotton per acre when cottonseed meal was added:

To unfertilized plot.....	8 lbs.
To acid phosphate plot.....	142 "
To kainit plot.....	95 "
To acid phosphate and kainit plot.....	207 "

Average increase with cottonseed meal..... 113 "

Increase of seed cotton per acre when acid phosphate was added:

To unfertilized plot.....	56 lbs.
To cottonseed meal plot.....	190 "
To kainit plot.....	46 "
To cottonseed meal and kainit plot.....	158 "

Average increase with acid phosphate..... 113 "

Increase in seed cotton per acre when kainit was added	
To unfertilized plot	215 lbs.
To cottonseed meal plot	302 "
To acid phosphate plot	205 "
To cottonseed meal and acid phos. plot	270 "
<hr/>	
Average increase with kainit	248 "

The lessons taught by this experiment are plain. The soil was deficient in nitrogen, phosphoric acid and potash. Every fertilizer was unprofitable when applied separately. Every combination of two fertilizers was but slightly profitable; all three used together were necessary for most profitable results. The complete fertilizer containing 200 pounds per acre of kainit (plot 9) was more profitable than the one containing half that quantity (plot 10). While cottonseed meal, acid phosphate and kainit were all necessary, the latter exerted the greatest influence in augmenting the yield during the unfavorable season of 1897.

The experimenter reports that rust prevailed on all plots without kainit, and that it was most destructive on the unfertilized plots.

It is evident from the data given elsewhere in this bulletin, that the favorable effect of kainit was at least largely attributable to its rust-restraining tendency.

Doubtless on any other field than that growing a pea crop the preceding year, cottonseed meal would have afforded a larger increase in yield.

GROUP III. NITROGEN MOST EFFECTIVE.

EXPERIMENT MADE BY J. L. BALLARD FOR SOUTHWEST ALABAMA AGRICULTURAL SCHOOL, JACKSON, CLARKE COUNTY.

Red soil, 5 inches deep; subsoil red clay.

This upland field had been cleared ten years, the original growth having been pine, oak, etc. It was in corn and cow-peas in 1896, in cotton in 1894 and 1895. The weather was

almost continually dry during the growing season, and from this cause the crop was greatly injured.

Jackson experiment with cotton.

Plot No.	FERTILIZERS.		No. plants per plot.	SEED C'TT'N		FINANCIAL RESULTS		
	Amount per acre.	KIND.		Yield per acre.	Increase over unfertilized plots.	Value of increase at 2c per lb.	Cost of fertilizers per acre.	Profit from fertilizers.
	Lbs.			Lbs.	Lbs.			
1	200	Cottonseed meal.....	777	532	170	\$3.40	\$1.90	\$1.50
2	240	Acid phosphate.....	756	512	150	3.00	1.32	1.68
3	00	No fertilizer.....	714	362	.....	.....	.....	.....
4	200	Kainit.....	735	390	22	44	1.38	-.94
5	200	Cottonseed meal.....	777	626	253	5.06	3.22	1.84
	240	Acid phosphate.....						
6	200	Cottonseed meal.....	756	808	269	5.38	3.28	2.10
	200	Kainit.....						
7	240	Acid phosphate.....	735	588	204	4.08	2.70	1.38
	200	Kainit.....						
8	00	No fertilizer.....	756	390	.....	.....	.....	.....
9	200	Cottonseed meal.....	672	532	140	2.40	4.60	-2.20
	240	Acid phosphate.....						
	200	Kainit.....						
10a	200	Cottonseed meal.....	.....	512	122	2.44	3.90	-1.46
	240	Acid phosphate.....						
	100	Kainit.....						
10b	200	Cottonseed meal.....	.....	590	200	4.00	5.40	-1.40
	240	Acid phosphate.....						
	100	Kainit.....						
	600	Lime.....						

Increase of seed cotton per acre when cottonseed meal was added:

To unfertilized plot	170 lbs.
To acid phosphate plot	103 "
To kainit plot	247 "
To acid phosphate and kainit plot	-64 "

Average increase with cottonseed meal 114 "

Increase of seed cotton per acre when acid phosphate was added:

To unfertilized plot	150 lbs.
To cottonseed meal plot.....	83 "
To kainit plot	182 "
To cottonseed meal and kainit plot.....	—129 "

Average increase with acid phosphate..... 72 "

Increase in seed cotton per acre when kainit was added:

To unfertilized plot	22 lbs.
To cottonseed meal plot.....	99 "
To acid phosphate plot	54 "
To cottonseed meal and acid phos. plot.....	—113 "

Average increase with kainit..... 16 "

Both cottonseed meal and acid phosphate increased the yield, cottonseed meal leading in spite of the preceding crop of cowpeas. Kainit was not effective, and the only plots on which any rust was noticed were plots 1 and 3. With lime there was an increase of seventy-eight pounds of seed cotton (compare plots 10a and 10b), or just enough to pay the cost of the lime. Doubtless in a normal season fertilizers would afford results very different from those of 1897, when complete fertilizers made a very poor showing.

EXPERIMENT MADE BY W. T. HIGHTOWER, PEROTE, BULLOCK COUNTY.

Red soil, with clay subsoil at a depth of 8 inches.

This field had been in cultivation thirty-seven years. The growth was red oak and post oak. The crop in 1895 and 1896 was corn.

The weather was very hot and dry during the growing season, and there was "no rust or dropping of leaves or fruit except from dry weather."

Perote experiment with cotton.

Plot No.	FERTILIZERS.		Per cent. of crop at first picking, Aug. 9.	SEED COTTON FINANCIAL RESULTS				
	Amount per acre.	KIND.		Yield per acre.	Increase over unfertilized plots.	Value of increase at 2c per lb.	Cost of fertilizers per acre.	Profit from fertilizers.
	Lbs.			Lbs.	Lbs.			
1	200	Cottonseed meal.....	13	624	184	\$3 68	\$1 90	\$1 78
2	240	Acid phosphate.....	29	496	56	1 12	1 32	—20
3	00	No fertilizer.....	25	440	.....	.....	.....	.....
4	200	Kainit.....	28	568	104	2 08	1 38	70
5	200	Cottonseed meal.....	23	736	248	4 96	3 22	1 74
	240	Acid phosphate.....						
6	200	Cottonseed meal.....	22	744	232	4 64	3 28	1 46
	200	Kainit.....						
7	240	Acid phosphate.....	22	688	152	3 04	2 70	34
	200	Kainit.....						
8	00	No fertilizer.....	17	560	.....	.....	.....	.....
9	200	Cottonseed meal.....	18	656	96	1 92	4 60	—2 68
	240	Acid phosphate.....						
10	200	Kainit.....	17	512	—48	—96	3 90	—4 86
	200	Cottonseed meal.....						
	240	Acid phosphate.....						
	100	Kainit.....						

Increase of seed cotton per acre when cottonseed meal was added:

To unfertilized plot.....184 lbs.

To acid phosphate plot.....192 "

To kainit plot.....128 "

To acid phosphate and kainit plot.....—152 "

Average increase with cottonseed meal.....126 "

Increase of seed cotton per acre when acid phosphate was added:

To unfertilized plot..... 56 lbs.

To cottonseed meal plot..... 64 "

To kainit plot..... 48 "

To cottonseed meal and kainit plot..... —136 "

Average increase with acid phosphate..... 42 "

Increase in seed cotton per acre when kainit was added:

To unfertilized plot	104 lbs.
To cottonseed meal plot.....	48 "
To acid phosphate plot	96 "
To cottonseed meal and acid phos. plot..	—152 "

Average increase with kainit..... 62 "

Cottonseed meal was most effective. It was also most profitable, although at best the profit was slight. There was a large financial loss when a complete fertilizer was used at the rate of 540 and 640 pounds per acre.

EXPERIMENT MADE BY T. K. JONES, 2 MILES SOUTH OF GREENSBORO, HALE COUNTY.

Yellowish, sandy soil.

This land has been in cultivation, chiefly in cotton, for more than thirty years. The original growth is reported as hickory, oak and other hard woods. The number of stalks per eighth acre plot was as follows: 1274 on plot 1, 1000 on plot 2, 1016 on plot 3, 1048 on plot 4, 1049 on plot 5, 1126 on plot 6, 1023 on plot 7, 838 on plot 8, 1027 on plot 9, and 1086 on plot 10. In the following table no corrections have been made for a defective stand, for, judging by the fact that the unfertilized plot with 838 plants yielded more than the unfertilized plot with 1016 plants, the plots planted thickly had no advantage over other plots. The land was level and apparently very uniform. There was some rust on all plots, against which kainit was apparently ineffectual.

Greensboro experiment with cotton.

Plot No.	FERTILIZERS.		Per cent. of crop at first picking.	SEED COTTON		FINANCIAL RESULTS		
	Amount per acre.	KIND.		Yield per acre.	Increase over unfertilized plots.	Value of increase at 2c per lb.	Cost of fertilizers per acre.	Profit from fertilizers.
	<i>Lbs.</i>			<i>Lbs.</i>	<i>Lbs.</i>			
1	200	Cottonseed meal.....	38	904	304	\$6 08	\$1 90	\$4 18
2	240	Acid phosphate.....	50	704	104	2 08	1 32	76
3	00	No fertilizer.....	24	600	.....	.....	.....	.....
4	200	Kainit.	35	648	33	66	1 38	—72
5	200	Cottonseed meal.....	54	944	306	6 12	3 22	2 90
	240	Acid phosphate.....						
6	200	Cottonseed meal.....	51	968	310	6 20	3 28	2 92
	200	Kainit.						
7	240	Acid phosphate.....	46	768	91	1 82	2 70	—78
	200	Kainit.						
8	00	No fertilizer.....	21	696	.....	.....	.....	.....
	200	Cottonseed meal.....						
9	240	Acid phosphate.....	54	928	232	4 64	4 60	04
	200	Kainit.						
	200	Cottonseed meal.....						
10	240	Acid phosphate.....	62	912	216	4 32	3 90	42
	100	Kainit.						

Increase of seed cotton per acre when cottonseed meal was added:

To unfertilized plot	304 lbs.
To acid phosphate plot	204 "
To kainit plot	277 "
To acid phosphate and kainit plot.....	141 "

Average increase with cottonseed meal 232 "

Increase of seed cotton per acre when acid phosphate was added:

To unfertilized plot	104 lbs.
To cottonseed meal plot.....	2 "
To kainit plot	58 "
To cottonseed meal and kainit plot.....	78 "

Average increase with acid phosphate 61 "

Increase in seed cotton per acre when kainit was added:	
To unfertilized plot	33 lbs.
To cottonseed meal plot.....	6 "
To acid phosphate plot	-13 "
To cottonseed meal and acid phos. plot...	-74 "
<hr/>	
Average decrease with kainit.....	12 "

It is clear that nitrogen was more effective than phosphoric acid. Potash was useless and unprofitable. The most profitable fertilizer was cottonseed meal used alone.

EXPERIMENT MADE BY J. T. ROBERTSON, LEGRAND, MONTGOMERY COUNTY.

Gray soil, with clay subsoil at a depth of 3 inches.

This land had been in cultivation about forty years, and the crop in all recent years had been cotton. The original growth was oak, hickory, pine, etc.

The season was dry until several days of rainy weather about the middle of August, following which rust injured the plants growing on plots where no kainit was used.

LeGrand experiment with fertilizers.

Plot No.	FERTILIZERS.		Per cent. of crop at first picking Sept. 8.	SEED COTTON		FINANCIAL RESULTS		
	Amount per acre.	KIND.		Yield per acre.	Increase over unfertilized plot.	Value of increase at 2c per lb.	Cost of fertilizers per acre.	Profit from fertilizers.
1	200	Cottonseed meal.....	Lbs. 54	Lbs. 648	Lbs. 320	\$6 40	\$1 90	\$4 50
2	240	Acid phosphate.....	56	592	264	5 28	1 32	3 96
3	00	No fertilizer.....	51	328	.....	.....	.....	.....
4	200	Kainit.....	51	608	266	5 32	1 38	3 94
5	200	Cottonseed meal.....	59	776	419	8 38	3 22	5 16
	240	Acid phosphate.....						
6	200	Cottonseed meal.....	58	824	452	9 14	3 28	5 86
	200	Kainit.....						
7	240	Acid phosphate.....	52	736	351	7 12	2 70	4 42
	200	Kainit.....						
8	00	No fertilizer.....	.....	400	.....	.....	.....	.....
	200	Cottonseed meal.....						
9	240	Acid phosphate.....	53	1,000	600	12 00	4 60	7 40
	200	Kainit.....						
10	200	Cottonseed meal.....	53	944	544	10 88	3 90	6 98
	240	Acid phosphate.....						
	100	Kainit.....						

Increase of seed cotton per acre when cottonseed meal was added:

To unfertilized plot	320 lbs.
To acid phosphate plot	155 "
To kainit plot	186 "
To acid phosphate and kainit plot	249 "

Average increase with cottonseed meal.....225 "

Increase of seed cotton per acre when acid phosphate was added:

To unfertilized plot	264 lbs.
To cottonseed meal plot.....	99 "
To kainit plot	85 "
To cottonseed meal and kainit plot.....	148 "

Average increase with acid phosphate.....149 "

Increase in seed cotton per acre when kainit was added:

To unfertilized plot	266 lbs.
To cottonseed meal plot.	132 "
To acid phosphate plot	87 "
To cottonseed meal and acid phos. plot.	181 "
Average increase with kainit.	167 "

Plainly the chief need of this soil was for nitrogen. It is equally clear that phosphoric acid was also needed by this soil. Kainit was highly advantageous by reason of its rust-restraining tendency. Whether the latter fertilizer would be profitable in a normal season when rust is less prevalent is an open and interesting question. The complete fertilizers, made up of cottonseed meal, acid phosphate and kainit, were decidedly more profitable in 1897 than any single fertilizer or mixture of two fertilizers. Two hundred pounds per acre of kainit was more profitable than half that quantity.

In 1896, on the same farm, but on a different field, with a poor reddish soil, only fertilizers containing nitrogen were profitable, the increase in yield from the use of acid phosphate and kainit being scarcely appreciable. Both experiments agree in giving pre-eminence to cottonseed meal.

GROUP IV. PHOSPHORIC ACID, POTASH AND NITROGEN ALL EFFECTIVE.

EXPERIMENT MADE BY J. P. ANDERSON ON FARM OF DR. THOMAS, THOMASTON, MARENGO COUNTY.

Gray, sandy soil, 4 inches deep, with red clay subsoil.

This field had been in cultivation for thirty or forty years. All recent crops consisted of cotton. The original growth was oak, hickory, gum and pine. Rust was very injurious, especially on the plots where kainit was not used.

Thomaston experiment with cotton.

Plot No.	FERTILIZERS.		Per cent. of crop at first picking Aug. 24.	SEED COTTON		FINANCIAL RESULTS		
	Amount per acre.	KIND.		Yield per acre.	Increase over unfertilized plots.	Value of increase at 2c per lb.	Cost of fertilizers per acre.	Profit from fertilizers.
	<i>Lbs.</i>			<i>Lbs.</i>	<i>Lbs.</i>	\$	\$	\$
1	200	Cottonseed meal.....	50	640	—16	— 32	\$1 90	—2 22
2	240	Acid phosphate.....	53	744	88	1 76	1 32	44
3	00	No fertilizer.....	41	656	.....	.....	.....	.....
4	200	Kainit.....	48	728	118	2 36	1 38	93
5	200	Cottonseed meal.....	71	776	211	5 22	3 22	1 00
	240	Acid phosphate.....						
6	200	Cottonseed meal.....	59	832	312	6 24	3 28	2 96
	200	Kainit.....						
7	240	Acid phosphate.....	57	760	286	5 72	2 70	3 02
	200	Kainit.....						
8	00	No fertilizer.....	33	428	.....	.....	.....	.....
	200	Cottonseed meal.....						
9	240	Acid phosphate.....	43	1,036	608	12 16	4 60	7 59
	200	Kainit.....						
10	200	Cottonseed meal.....	47	984	556	11 12	3 90	7 22
	240	Acid phosphate.....						
	100	Kainit.....						

Increase of seed cotton per acre when cottonseed meal was added:

To unfertilized plot—16 lbs.

To acid phosphate plot 123 "

To kainit plot 194 "

To acid phosphate and kainit plot 322 "

Average increase with cottonseed meal..... 155 "

Increase of seed cotton per acre when acid phosphate was added:

To unfertilized plot 88 lbs.

To cottonseed meal plot..... 227 "

To kainit plot 168 "

To cottonseed meal and kainit plot 296 "

Average increase with acid phosphate..... 195 "

Increase in seed cotton per acre when kainit was added:

To unfertilized plot	118 lbs.
To cottonseed meal plot.....	328 "
To acid phosphate plot	198 "
To cottonseed meal and acid phos. plot....	397 "

Average increase with kainit..... 261 "

The most effective fertilizer was kainit, the favorable effect of which was due, at least in large part, to its effect in checking rust. Phosphoric acid and nitrogen were also needed by this soil. Every fertilizer was used to greater advantage in combination than alone. The complete fertilizers (plots 9 and 10) were most profitable, the one containing the larger quantity of kainit leading.

Mr. Anderson also conducted a fertilizer test in 1896. Although an accident prevented a statement of the yields, the appearance of the different plots led him to conclude that his soil needed a complete fertilizer and that nitrogen was especially important in 1896.

EXPERIMENT MADE BY A. AUTREY, BERNEYS, TALLADEGA COUNTY.

Soil and subsoil red clay ; soil 3 or 4 inches deep.

This field had been in cultivation forty or fifty years. The original forest growth was oak, pine and hickory. The preceding crop was oats. There was only about three-fourths of a stand on all plots. The plants on all plots remained free from all leaf diseases.

Berneys experiment with cotton.

Plot No.	FERTILIZERS.		Per cent. of crop at first picking, Sept. 2.	SEED COTTON		FINANCIAL RESULTS		
	Amount per acre.	KIND.		Yield per acre.	Increase over unfertilized plot.	Value of increase at 2c per lb.	Cost of fertilizers per acre.	Profit from fertilizers.
	Lbs.			Lbs.	Lbs.			\$
1	200	Cottonseed meal.....	11	456	8	\$0 16	\$1 90	-1 74
2	240	Acid phosphate.....	9	512	64	1 28	1 32	—04
3	00	No fertilizer.....	11	448				
4	200	Kainit.....	13	616	157	3 14	1 38	1 76
5	200	Cottonseed meal.....	20	680	210	4 20	3 22	98
	240	Acid phosphate.....						
6	200	Cottonseed meal.....	14	624	142	2 84	3 28	—44
	200	Kainit.....						
7	240	Acid phosphate.....	12	656	163	3 26	2 70	56
	200	Kainit.....						
8	00	No fertilizer.....	13	504				
9	200	Cottonseed meal.....	23	888	384	7 68	4 60	3 08
	240	Acid phosphate.....						
10	200	Kainit.....	26	800	296	5 92	3 90	2 02
	240	Acid phosphate.....						
	100	Kainit.....						

Increase of seed cotton per acre when cottonseed meal was added:

To unfertilized plot	8 lbs.
To acid phosphate plot	146 "
To kainit plot	—15 "
To acid phosphate and kainit plot	221 "
Average increase with cottonseed meal.....	90 "

Increase of seed cotton per acre when acid phosphate was added:

To unfertilized plot	64 lbs.
To cottonseed meal plot.....	202 "
To kainit plot	6 "
To cottonseed meal and kainit plot.....	242 "
Average increase with acid phosphate	129 "

Increase in seed cotton per acre when kainit was added:

To unfertilized plot	157 lbs.
To cottonseed meal plot.....	134 "
To acid phosphate plot	99 "
To cottonseed meal and acid phos. plot....	274 "

Average increase with kainit..... 166 "

The results, which are not as uniform as desirable, suggest that the land was somewhat deficient in all three of the usual fertilizer constituents. Kainit was slightly in the lead.

The greatest profit was afforded by the plots to which the complete fertilizers were applied.

**EXPERIMENT MADE ON FARM OF F. C. McDONALD, RUTLEDGE,
CRENSHAW COUNTY.**

The report does not describe the soil, but the prevailing soil in that locality is gray and sandy.

Rutledge experiment with fertilizers.

Plot No.	FERTILIZERS.		SEED COTTON		FINANCIAL RESULTS		
	Amount per acre.	KIND.	Yield per acre.	Increase over unfertilized plots.	Value of increase at 2c per lb.	Cost of fertilizers per acre.	Profit from fertilizers.
	Lbs.		Lbs.	Lbs.			\$
1	200	Cottonseed meal.....	600	48	\$0 96	\$1 90	— 94
2	240	Acid phosphate.....	760	208	4 16	1 32	2 84
3	00	No fertilizer.....	552	.....	.....	.....	.....
4	200	Kainit.....	696	150	3 00	1 38	1 62
5	200	Cottonseed meal.....	1032	493	9 86	3 22	6 64
	240	Acid phosphate.....					
6	200	Cottonseed meal.....	1140	607	12 14	3 28	8 86
	200	Kainit.....					
7	240	Acid phosphate.....	808	282	5 64	2 70	2 84
	200	Kainit.....					
8	00	No fertilizer.....	520	.....	.....	.....	.....
9	200	Cottonseed meal.....	1216	696	13 92	4 60	9 32
	240	Acid phosphate.....					
10	200	Kainit.....	1304	786	15 72	3 90	11 82
	240	Acid phosphate.....					
	100	Kainit.....					

Increase of seed cotton per acre when cottonseed meal was added:

To unfertilized plot	48 lbs.
To acid phosphate plot	285 "
To kainit plot	457 "
To acid phosphate and kainit plot	406 "

Average increase with cottonseed meal.....299 "

Increase of seed cotton per acre when acid phosphate was added:

To unfertilized plot	208 lbs.
To cottonseed meal plot.....	445 "
To kainit plot	132 "
To cottonseed meal and kainit plot.....	89 "

Average increase with acid phosphate.....219 "

Increase in seed cotton per acre when kainit was added:

To unfertilized plot	150 lbs.
To cottonseed meal plot.....	559 "
To acid phosphate plot	74 "
To cottonseed meal and acid phos. plot....	203 "

Average increase with kainit.....247 "

This soil was evidently deficient in all three of the essential elements of plant food, for it responded to every fertilizer or combination of fertilizers. The largest yields and the greatest profits were obtained by the use of the complete fertilizers. In a complete fertilizer 100 pounds of kainit per acre was better than double that quantity.

Likewise in 1896 this soil responded profitably to each of the three usual fertilizer ingredients, the complete fertilizer affording a greater profit than combinations in which any one of these was wanting.

EXPERIMENT MADE by A. M. VALERO, DAPHNE, BALDWIN COUNTY.

The experimenter describes the soil as follows: "Poor, pine land; stiff red clay soil, with some humus at the top; pretty well worn out by five years' of corn culture, during which time it was poorly cultivated and fertilized."

"The severe hot weather, which has no precedent in the meteorological records of this county, has proved a drawback to the growth of the plants."

By an oversight, all fertilizers were applied at a rate per acre, which is 25 per cent. greater than the rate for any other experiment in this bulletin.

Daphne experiment with fertilizers.

Plot No.	FERTILIZERS.		SEED COTTON		FINANCIAL RESULTS		
	Amount per acre.	KIND.	Yield per acre.	Increase over unfertilized plots.	Value of increase at 2c per lb.	Cost of fertilizers per acre.	Profit from fertilizers.
	Lbs.		Lbs.	Lbs.			
1	250	Cottonseed meal.....	200	120	\$2 40	\$2 38	\$0 02
2	300	Acid phosphate.....	100	20	40	1 65	-1 25
3	00	No fertilizer.....	80	.....	.....	.....	.....
4	250	Kainit.....	150	70	1 40	1 73	- 33
5	250	Cottonseed meal.....	350	270	5 40	4 03	1 37
	300	Acid phosphate.....					
6	250	Cottonseed meal.....	440	360	7 20	4 10	3 10
	300	Kainit					
7	300	Acid phosphate.....	520	440	8 80	3 38	5 42
	250	Kainit					
8	00	No fertilizer.....	80	.....	.....	.....	.....
9	250	Cottonseed meal.....	560	480	9 60	5 75	3 85
	300	Acid phosphate.....					
	250	Kainit.....					
10	250	Cottonseed meal.....	600	520	10 40	5 81	4 59
	300	Acid phosphate.....					
	125	Kainit.....					
	375	Lime.....					

Increase of seed cotton per acre when cottonseed meal was added:

To unfertilized plot120 lbs.
 To acid phosphate plot250 "
 To kainit plot290 "
 To acid phosphate and kainit plot 40 "

Average increase with cottonseed meal..... 175 "

Increase of seed cotton per acre when acid phosphate was added:

To unfertilized plot 20 lbs.
 To cottonseed meal plot.....150 "
 To kainit plot370 "
 To cottonseed meal and kainit plot.....120 "

Average increase with acid phosphate..... 165 "

Increase in seed cotton per acre when kainit was added:

To unfertilized plot	70 lbs.
To cottonseed meal plot.....	240 "
To acid phosphate plot	420 "
To cottonseed meal and acid phos. plot....	210 "

Average increase with kainit.....235 "

Applied singly, every fertilizer entailed a financial loss. In combination, each of the three fertilizing material was effective, indicating that the soil was deficient in nitrogen, phosphoric acid and potash. Kainit was most effective. The most profitable fertilizer consisted of a mixture of kainit and acid phosphate.

**GROUP V. PHOSPHORIC ACID AND NITROGEN
ABOUT EQUALLY EFFECTIVE, AND POTASH
NOT VERY EFFECTIVE.**

**EXPERIMENT MADE BY T. T. MEADOWS, CUSSETA, CHAMBERS
COUNTY.**

Red soil, with clay foundation at a depth of 3 inches.

This field had been in cultivation forty or fifty years. It was very poor. The season was "very dry until July 9; then rain was too late to benefit the plants, as they had stopped growing and made no second growth." There was some rust. There were no outside rows.

Cusseta experiment with cotton.

Plot No.	FERTILIZERS.		SEED COTTON		FINANCIAL RESULTS		
	Amount per acre.	KIND.	Yield per acre.	Increase over unfertilized plots.	Value of increase at 2c per lb.	Cost of fertilizers per acre.	Profit from fertilizers.
1	Lbs. 200	Cottonseed meal.....	Lbs. 200	Lbs. 104	\$2 08	\$1 80	\$0 18
2	240	Acid phosphate.....	256	160	3 20	1 32	1 88
3	00	No fertilizer.....	96	.....	.....	.....	.....
4	200	Kainit.....	120	29	58	1 38	— 80
5	200	Cottonseed meal.....	200	.....	.....	.....	.....
	240	Acid phosphate.....	448	362	7 24	3 22	4 02
6	200	Cottonseed meal.....	200	.....	.....	.....	.....
	200	Kainit.....	336	254	5 08	3 28	1 80
7	240	Acid phosphate.....	200	.....	.....	.....	.....
	200	Kainit.....	192	115	2 30	2 70	— 40
8	00	No fertilizer.....	72	.....	.....	.....	.....
9	200	Cottonseed meal.....	200	.....	.....	.....	.....
	240	Acid phosphate.....	440	368	7 36	4 60	2 76
10	200	Kainit.....	200	.....	.....	.....	.....
	240	Cottonseed meal.....	200	.....	.....	.....	.....
10	240	Acid phosphate.....	504	432	8 64	3 90	4 74
	100	Kainit.....	.....	.....	.....	.....	.....

Increase of seed cotton per acre when cottonseed meal was added:

To unfertilized plot	104 lbs.
To acid phosphate plot	202 "
To kainit plot	235 "
To acid phosphate and kainit plot	253 "

Average increase with cottonseed meal.....199 "

Increase of seed cotton per acre when acid phosphate was added:

To unfertilized plot	160 lbs.
To cottonseed meal plot.....	258 "
To kainit plot	84 "
To cottonseed meal and kainit plot.....	114 "

Average increase with acid phosphate.....156 "

Increase in seed cotton per acre when kainit was added:

To unfertilized plot	29 lbs.
To cottonseed meal plot.....	150 "
To acid phosphate plant	—45 "
To cottonseed meal and acid phos. plot....	6 "

Average increase with kainit..... 36 "

Cottonseed meal and acid phosphate were both fairly effective.

The most profitable fertilizer was a complete fertilizer containing 200 pounds per acre of cottonseed meal, 240 pounds of acid phosphate, and only 100 pounds of kainit. A close second to this in point of profit was a mixture of cottonseed meal and kainit.

Of the three separate fertilizer materials kainit was least effective and practically worthless except when combined with cottonseed meal.

EXPERIMENT MADE BY T. J. THOMASON, KAYLOR, RANDOLPH COUNTY.

Gray soil 5 or 6 inches deep; yellow subsoil.

This field was supposed to have been cleared for about fifty years. The preceding crop was cotton. Nothing is said about fertilizers used in previous years, but the good yields obtained on the unfertilized plots—888 and 1000 pounds of seed cotton per acre—suggest that the land had been highly fertilized in recent years. Rust did not do any special damage.

Kaylor experiment with cotton.

Plot No.	FERTILIZERS.		Per cent. of crop at first picking, Sept. 15.	SEED COTTON		FINANCIAL RESULTS		
	Amount per acre.	KIND.		Yield per acre.	Increase over unfertilized plot.	Value of increase at 2c per lb.	Cost of fertilizers per acre.	Profit from fertilizers.
	<i>Lbs.</i>			<i>Lbs.</i>	<i>Lbs.</i>			
1	200	Cottonseed meal.....	37	1116	228	\$4 56	\$1 90	\$3 36
2	240	Acid phosphate.....	32	1240	352	7 04	1 32	5 72
3	00	No fertilizer.....	18	888	.....	.....	.....	.....
4	200	Kainit.....	21	1024	114	2 28	1 38	90
5	200	Cottonseed meal.....	34	1320	387	7 74	3 22	4 52
	240	Acid phosphate.....						
6	200	Cottonseed meal.....	32	1200	245	4 90	3 28	1 62
	200	Kainit.....						
7	240	Acid phosphate.....	31	1120	142	2 84	2 70	14
	200	Kainit.....						
8	00	No fertilizer.....	25	1000	.....	.....	.....	.....
9	200	Cottonseed meal.....	30	1312	312	6 24	4 60	1 64
	240	Acid phosphate.....						
	200	Kainit.....						
10	200	Cottonseed meal.....	31	1360	360	7 20	3 90	3 30
	240	Acid phosphate.....						
	100	Kainit.....						

Increase of seed cotton per acre when cottonseed meal was added:

To unfertilized plot 228 lbs.
 To acid phosphate plot 35 "
 To kainit plot 131 "
 To acid phosphate and kainit plot 170 "

Average increase with cottonseed meal..... 141 "

Increase of seed cotton per acre when acid phosphate was added:

To unfertilized plot 352 lbs.
 To cottonseed meal plot..... 159 "
 To kainit plot 28 "
 To cottonseed meal and kainit plot..... 67 "

Average increase with acid phosphate..... 152 "

Increase in seed cotton per acre when kainit was added:	
To unfertilized plot	114 lbs.
To cottonseed meal plot.....	17 "
To acid phosphate plot	—210 "
To cottonseed meal and acid phos. plot...	—75 "

Average decrease with kainit..... 39 "

Acid phosphate and cottonseed meal were about equally effective, both giving moderately profitable returns. Kainit was used at a loss. The plot which yielded most profit was the one to which acid phosphate alone was applied.

Neither in 1896 nor in 1897 was the complete fertilizer the most profitable fertilizer for land capable of producing 800 to 1000 pounds of seed cotton per acre.

INCONCLUSIVE EXPERIMENTS.

The experiment near McLendon, Russell county, was made by J. J. Blackstock on the farm of Hirsch Brothers.

The field was level and the soil loamy. It had been cleared about sixty years before. The original growth was gum and short leaf pine. The stand was reported good.

The variable effect of fertilizer in the several mixtures renders conclusions impossible, but raises the suspicion that the soil, by reason either of a sufficiency of all three of the usual forms of commercial plant food, or because of defective physical condition, was unable to profit by any of the ordinary commercial fertilizers. In 1896 also the results were negative or inconclusive.

An experiment was made by J. B. Craddock on farm of Southeast Alabama Agricultural School, Abbeville, Ala. :

The land had been in cultivation for about fifty years. The original growth was oak and hickory.

The experiment is incomplete, having no unfertilized plot, but by comparing the yield obtained by use of the mixture containing all three fertilizers with the yields afforded by

the plots to which fertilizers were applied singly and two by two, we find that the results in 1897 agree substantially with those of 1890, 1891, 1892 and 1896 in showing that all three of the usual fertilizer constituents increase the yield of cotton on this soil.

The experiment at Jacksonville was conducted by Prof. C. W. Daugette. The figures afford no suggestions as to the needs of this soil. Probably previous applications of manure, or previous methods of treatment, have rendered the field unfit for experimental purposes.

EXPERIMENT MADE BY DR. JOHN T. GORDON, HEALING SPRINGS
WASHINGTON COUNTY.

Gray, sandy soil, 12 inches deep; sandy clay subsoil.

The field is described as a gently rolling ridge between two branches, on which the original growth was long leaf pine. It was in cotton in 1896, and for the three years preceding that time it was continuously in corn and cowpeas. "There was no rust or other leaf disease. Leaves remained green until the dry, hot winds came, about the last of August and first of September, when the leaves seemed to wither, at first in spots, afterwards pretty generally."

Although the yields of the unfertilized plots point to uniformity in natural fertility, the results are perplexing. Apparently some undiscovered cause was more influential than the fertilizers. This is the fifth test of fertilizers on this soil. Previous results were either inconclusive or suggestive of a deficiency of all three of the usual fertilizer ingredients.

EXPERIMENT MADE BY F. FUNKEY, 1½ MILES SOUTH OF TUSCUMBIA,
COLBERT COUNTY.

Reddish soil and subsoil.

This field had been in cultivation about fifty years. The original forest growth was oak, blackjack oak and hickory. Oats was the crop in 1894, corn in 1895 and 1896. The stand

was reported as good. The season was dry after July 1. The land was not sufficiently uniform to permit of conclusions.

The experiment at Evergreen was made by F. M. Roundtree on the farm of the South Alabama Agricultural School, on red sandy soil. The test is not conclusive.

The figures suggest in 1897, as also in 1896, a need of nitrogen in spite of the fair yields obtained on the unfertilized plots. It is evident that the variations in the fertility of the soil are so great and so abrupt as to render impossible the drawing of any definite conclusions from these experiments.

EXPERIMENT MADE BY J. A. WILKINSON, 4 MILES WEST OF
AUTAUGAVILLE, AUTAUGA COUNTY.

Soil, chocolate sandy, or red; subsoil red, with some gravel.

This land, cultivated for fifty or sixty years, had been in cotton for many years without fertilizers of any kind. The stand was uniform. Rust, present on some plots, was apparently not destructive. The weather was dry during most of the growing season, which probably explains the slight influence of fertilizers on the yield.

The wide variation in the yields of the two unfertilized plots introduces an element of uncertainty which is, perhaps, not entirely overcome by the method of computing the increase.

Bearing this in mind, we can regard the experiment as only suggestive, and not as indicative, of a moderate increase from cottonseed meal and kainit, and of a slight effect from acid phosphate.

An experiment was made by Mr. G. W. Smith one mile

southeast of Brundidge. It was made on gray soil, underlaid by clay at a depth of two feet. The field had been cleared 44 years. The original growth was oak, hickory, gum and dogwood. Preceding crops were cotton in 1895 and 1896, and corn in 1894.

The great difference in the yields of the two unfertilized plots prohibits drawing any definite conclusions as to the relative values of the three fertilizing materials, all of which, under some conditions, were apparently beneficial.

Inconclusive experiments with cotton.

Plot No.	Amount per acre.	FERTILIZERS.	MCLENDON.		ABBEVILLE.	JACKSONVILLE.	HEALING SPRINGS.		EVERGREEN.		TUSCUMBIA.		AUTAUGAVILLE.		BRUNDRIDGE.	
		KIND.	Seed cotton per acre.	Inc. over unfertilized plots.	Seed cotton per acre.	Seed cotton per acre.	Seed cotton per acre.	Inc. over unfertilized plots.	Seed cotton per acre.	Inc. over unfertilized plots.	Seed cotton per acre.	Inc. over unfertilized plots.	Seed cotton per acre.	Inc. over unfertilized plots.	Seed cotton per acre.	Inc. over unfertilized plots.
1	200	Cottonseed meal.....	Lbs. 680	Lbs.	Lbs. 624	Lbs. 672	Lbs. 864	Lbs. 608	Lbs. 1616	Lbs. 328	Lbs. 736	Lbs. 280	Lbs. 470	Lbs. 30	Lbs. 860	Lbs. 330
2	240	Acid phosphate.....	592	-88	408	1200	864	608	1144	-144	768	312	510	70	680	210
3	00	No fertilizer.....	680	.....	.....	972	256	.....	1288	.....	456	.....	440	.....	470	.....
4	200	Kainit.....	912	213	408	1456	832	579	1296	51	640	104	560	84	704	165
5	200	Cottonseed meal.....	1000	282	824	1256	672	423	1776	590	984	368	670	158	992	384
	240	Acid phosphate.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
6	200	Cottonseed meal.....	872	134	736	1136	720	474	1512	380	816	120	840	292	1136	458
	200	Kainit.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
7	200	Acid phosphate.....	728	-29	824	904	736	493	1280	97	880	104	690	106	1152	405
	200	Kainit.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
8	00	No fertilizer.....	776	.....	.....	1264	240	.....	1032	.....	856	.....	620	.....	816	.....
	200	Cottonseed meal.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
9	240	Acid phosphate.....	744	-32	976	1184	776	536	1304	272	976	120	680	60	1216	410
	200	Kainit.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
10a	200	Cottonseed meal.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	240	Acid phosphate.....	728	-48	816	1024	880	640	890	-142	1032	176	600	-20	920	104
10b	100	Kainit.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	200	Cottonseed meal.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
10b	240	Acid phosphate.....	.....	.....	.....	.....	656	416	992	-40	.....	.....	.....	.....	.....	.....
	100	Kainit.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
10b	600	Slacked lime.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

EFFECT OF KAINIT ON RUST.

In Bulletin No. 89 were published the results of a fertilizer experiment made in 1897 on the station farm, in which kainit exerted a decided effect in reducing the injury due to "rust," or "blight." Early in the summer every one conducting a fertilizer test for this station was requested to keep a record of the amount of rust or other leaf disease on the plots differently fertilized.

The records bearing on this subject are summarized here:

Number of experiments in which kainit was decidedly effective in checking leaf disease.....	8
Number of experiments where rust was present, and where kainit did not check it.....	5
Number of experiments where the rust-restraining effects of kainit were slight.....	3
Number of experimenters reporting no difference between different plots, but failing to note the presence or absence of leaf diseases.....	3
Number of experiments entirely free from rust.....	9

The other reports contained no data relative to this question.

At Lumber Mills, after the rainy weather beginning August 14, "all plots that had no kainit began to throw off leaves. The leaves would have dark spots come on them, and then they would rot and drop off. Plot 5 shed worse than the others. Plot 4 did not shed any."

At Cusseta there was some rust on plot 5 (cottonseed meal and acid phosphate), but none on plot 9 (complete fertilizer). No notes were recorded relative to the presence or absence of rust on the other plots. The experimenter writes: "Kainit helps to keep off rust."

Mr. J. M. King, who conducted a test at Wilson, Escambia county, but whose numerical results were not sent in, writes as follows:

"During July plots 1 and 5 were the best, but as the

weather became dryer and hotter these plants began to blight, the leaves and forms began to shed, and by the last of August both plots were dead. Plot 4 (kainit) remained green the longest."

From Coatopa the experimenter writes: "August 10 I thought the plants on all plots were dead—rusted. They afterwards put out some leaves on the following plots: 4, 6, 7, 9 and 10." These were the plots which received kainit.

Kainit in this experiment afforded a larger increase in yield than acid phosphate or cottonseed meal, which result is probably attributable rather to this renewed growth on the kainit plots than to a special deficiency of potash in the soil.

The report from Thomaston contains the following notes: "Rust was bad on all plots relatively in order named: 5, 8, 3, 2, 7, 4, 10 and 9. Kainit does not prevent, but only alleviates, rust."

At Union Springs, on a field especially subject to rust, "the extreme heat of the last of June caused all plots to shed, where no kainit was used, especially plots 1, 2 and 5. July 8 I noticed that rust appeared on the unfertilized plots. July 15 rust appeared on plots 1, 2 and 5," those receiving no kainit. No mention is made of rust in connection with plots fertilized with kainit.

From LeGrand, Mr. Robertson writes: "There was comparatively no shedding of leaves or rust except on plots where there was no kainit used. Plot 4 did not shed a leaf, and remained green until frost. Plots 9 and 10 did almost as well."

At Naftel "Nos. 1, 2, 3 and 8 suffered more with rust than the others; Nos. 3 and 8 (unfertilized) more than any other." The report contains the following estimate of the percent-

age of leaves which were shed prematurely as a result of rust:

Plot 1 (cottonseed meal).....	50%
Plot 2 (acid phosphate).....	33%
Plot 3 (no fertilizer).....	75%
Plot 4 (kainit).....	00%
Plot 5 (meal and phosphate).....	20%
Plot 6 (meal and kainit).....	00%
Plot 7 (phosphate and kainit).....	00%
Plot 8 (no fertilizer).....	60%
Plot 9 (meal, phosphate and kainit).....	00%
Plot 10 (meal, phosphate and kainit).....	1%

Here both 100 and 200 pounds per acre of kainit effectually checked rust.

Above we have the reports which show a decided rust-restraining effect of kainit.

Five experiments, as follows, show that kainit, under their prevailing local conditions, failed to reduce the injury from leaf diseases. At Tuscaloosa the amount of rust was as great on the kainit plots as on any others. This field had been subsoiled by following the turn plow with a scooter. At Abbeville there was apparently no uniform effect on rust due to kainit. At Prattville "plot 1 was worse affected, and commenced to drop the leaves about five or six days sooner than the others. All the rest dropped the leaves about the same time."

At Jackson rust was detected only on plot 1 (cottonseed meal) and plot 3 (unfertilized). At Greensboro there was some rust on all plots, but no marked difference.

It is evident from the preceding paragraphs that kainit did check leaf diseases in eight of the thirteen experiments affording definite data. This is equal to 61 per cent. of favorable results.

It is not strange that the effect of kainit on rust was widely different under different conditions of soil and weather.

For that little word "rust" is used to include almost all of the leaf diseases, of which Prof. G. F. Atkinson has described several in the earlier bulletins of this station. The one which, in his experiments, was influenced by kainit, was what is generally known as black rust, but which he designated as "mosaic disease," or "yellow leaf blight."

Leaf diseases were widely prevalent and destructive in 1897, and until late summer dry weather was general. Remembering these abnormal conditions, we should not expect kainit to exert so favorable an effect in normal seasons and in years when leaf diseases are less injurious.

