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ALABAMA

Agricultural Experiment Station

OF THE

Alabama Polytechnic Institute,

AUBURN.

Co-operative Fertilizer Experiments With Cotton

IN 1901, 1902, 1903, AND 1904.

By

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CO-OPERATIVE FERTILIZER EXPERIMENTS WITH COTTON IN 1901, 1902, 1903, AND 1904.

By J. F. Duggar.

A brief summary of the average results of these experiments may be found on page 67.

For a number of years this station has conducted numerous local fertilizer experiments, furnishing material and instructions to farmers agreeing to make the tests.

The number of local fertilizer experiments with cotton, of which reports were received, was as follows: In 1901, ten; in 1902, thirteen; in 1903, ten, and in 1904, twenty-one. This does not include a number of experiments that were made, but of which the experimenters made no reports or reported accidental loss of results. In all of these years fertilizer experiments were also made on corn and other crops, the results of which will be published in future years.

The chief object of these local fertilizer experiments or soil tests has been to ascertain the best fertilizer or combination of fertilizers for cotton, growing on each of the principal soils of Alabama.

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 list gives the name and address of each experimenter who has reported the results of fertilizer experiments made under our direction during the last four years, with page of this bulletin where the results may be found:

COUNTY.	POST OFFICE.	NAME.	DATE.	PAGE.
Barbour	Louisville	J. D. Veal	1904	58 & 60
Bibb	Vick	W. T. Chism	1901, '2, '3	49
Blount	Tidmore	Jno. W. Staab	1901	36
Bullock	Union Sp'gs	N. Gachet	1904	74
Butler	Garland	G. L. McLure	1901	60 & 62
Butler	Greenville	D. H. Rouse	1901	55 & 56
Butler	Georgiana	J. C. Lee	1904	60 & 61
Chambers	Fredonia	E. W. Smartt	1904	73
Chilton	Clanton	W. A. Chandler	1904	73
Choctaw	Naheola	W. G. Bevill	1901, '02	54
Coffee	Enterprise	C. A. Hatcher	1904	59 & 60
Conecuh	Evergreen	J. W. Stewart	1902	55 & 57
Coosa	Hanover	J. M. Logan	1902, '03	50, 51 & 73
Cullman	Cullman	L. A. Fealy	1903	36 & 38
Dale	Midland City	W. H. Simmons	1904	63
DeKalb	Collinsville	W. F. Fulton	1902, '3	30
Elmore	Wetumpka	5th Dist. Agr. School	1901, '2, '3	44, 47 & 73
Elmore	Tallassee	J. D. Billingsley	1903	45 & 47
Fayette	Newtonville	G. W. Gravlee	1904	73
Franklin	Russellville	G. R Pass	1904	33 & 36
Geneva	Geneva	M. P. Metcalf	1901, '2, '3, '4	64 & 74
Hale	Greensboro	T. K. Jones	1902, '4	74
Lauderdale	Florence	W. A. Parish	1904	51 & 52
Lawrence	Town Creek	A. A. Owens	1904	73
Lee	Auburn	Ala. Expt. Sta.	1902, '4	47
Limestone	Athens	P. G. Williams	1903	51 & 53
Macon	Notasulga	J. P. Slaton	1904	46
Madison	Huntsville	C. Davis	1901	24
Madison	Huntsville	H, D. N. Wales	1902, '3, '4	24 & 26
Marion	Hamilton	6th Dist. Agr. School	1903	43
Perry	Long	L. Long	1902	34 & 36
Pickens	Gordo	J. W. French	1901	39
Pickens	Gordo	D. W. Davis	1902	40
Shelby	Montevallo	J. W. Wyatt	1904	31 & 32
Talladega	Silver Run	C. L. Jenkins	1902, '3, '4	28
Tallapoosa	Camp Hill	Lyman Ward	1902	50 & 51
Tuscaloosa	Tuscaloosa	E. J. Daffin	1901	41
Washington	Carson	R. D. Palmer	1904	74

The directions sent required each plot to be one-eighth of an acre in area. Rows were 3 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, preferable 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.

The Rainfall.

The following data are taken from the records of the Alabama section of the Weather Bureau and show the average rainfall for the State:

	INCHES RAINFALL.				
	1901	1902	1903	1904	
January	5.32	3.86	3.56	4.17	
February	4.13	6.52	10.95	3.80	
March	6.30	8.76	5.91	3.69	
April	5.27	2.34	2.72	2.22	
May	5.08	2.34	6.05	2.98	
June	2.80	1.28	4.88	2.94	
July	3.40	2.50	3.98	4.80	
August	8.86	3.48	3.57	5.55	
September	4.19	4.28	1.41	1.36	
October	1.04	3.58	1.82	0.34	
November	1.85	4.22	2.12	2.98	
December	7.80	5.77	2.93	4.38	
Average	55.97	49.09	50.22	39.21	
Average yearly normal					51

In the summer of 1902 occurred a drought of unprecedented duration. This was general and in many localities there was little or no rain from April to August. Hence results of that year should be given less weight than those for the other years. In 1904 there was a deficiency of rain in spring and an injurious drought beginning about the middle of August.

THE FERTILIZERS USED.

The following prices are used, as representing approximately the average cash price in local markets during the last few years:

	Per Ton.
Acid phosphate (14 per cent. available)	$14.00
Cotton seed meal	22.00
Kainit	15.00

Prices naturally vary in different localities. Any one can substitute the cost of fertilizers in his locality for the prices given above.

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. Amount per acre.	FERTILIZERS. KIND.	MIXTURE CONTAINS Nitrogen.	MIXTURE CONTAINS †Available phosphoric acid.	MIXTURE CONTAINS Potash.	COST OF FERTILIZERS Per ton.	COST OF FERTILIZERS Per acre.
	Lbs.		*Lbs.*	*Lbs.*	*Lbs.*		
1	200	Cotton seed meal	13.58	5.76	3.54	$22.00	$2.20
		In 100 *lbs. c. s meal.**	**6.79**	**2.88**	**1.77**		
2	240	Acid phosphate	.....	36.12	.....	14.00	1.68
		In 100 *lbs. acid phos.*	.....	**15.05**	.....		
4	200	Kainit	.....	.....	24.60	15.00	1.50
		In 100 *lbs. kainit.*	.....	.....	**12.30**		
5	200	Cotton seed meal ...	13.58	41.88	3.54	17.63	3.88
	240	Acid phosphate					
		In 100 *lbs. above mixt.*	**3.09**	**9.52**	**.80**		
6	200	Cotton seed meal ...	13.58	5.76	28.14	17.50	3.70
	200	Kainit					
		In 100 *lbs. above mixt.*	**3.39**	**1.44**	**7.03**		
7	240	Acid phosphate	.....	.....	.....	14.45	3.18
	200	Kainit					
		In 100 *lbs. above mixt.*	...	**8.21**	**5.59**		
9	200	Cotton seed meal ...	13.58	41.88	28.14	16.81	5.38
	240	Acid phosphate					
	200	Kainit					
		In 100 *lbs. above mixt.*	**2.12**	**6.54**	**4.39**		
10	200	Cotton seed meal ...	13.58	41.88	15.84	17.15	4.63
	240	Acid phosphate					
	100	Kainit					
		In 100 *lbs. above mixt.*	**2.59**	**7.75**	**2.93**		

*Average of many analysis.

†Counting all the phosphoric acid in cotton seed 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 $1\frac{3}{14}$.

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.

PRICE ASSUMED FOR SEED COTTON.

The price assumed is 8 cents per pound for lint and $12.00 per ton for seed. Deduct from this the cost of picking and ginning, ½ cent per pound of seed cotton, and we have $2\frac{6}{10}$ cents as the *net* value per pound of increase of seed cotton; this last figure is used in all calculations of profits in this bulletin.

Huntsville experiments with cotton.

Plot No.	Amount per acre.	FERTILIZER. KIND.	HUNTSVILLE (Davis) 1901		HUNTSVILLE (Wales) 1902		HUNTSVILLE (Wales) 1903		HUNTSVILLE (Wales) 1904	
			Yield of seed cotton per acre.	Increase over unfertilized plots.	Yield of seed cotton per acre.	Increase over unfertilized plots.	Yield of seed cotton per acre.	Increase over unfertilized plots.	Yield of seed cotton per acre.	Increase over unfertilized plots.
	Lbs.		*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs*	*Lbs.*
1	200	Cotton seed meal	332	—96	416	56	640	216	416	64
2	240	Acid phosphate	524	96	384	24	712	288	472	120
3	00	No fertilizer	428		360		424		352	
4	200	Kainit	512	78	353	00	600	192	344	—5
5	200 240	Cotton seed meal ... Acid phosphate	592	154	384	37	712	320	872	526
6	200 200	Cotton seed meal ... Kainit	420	—22	408	67	656	280	704	362
7	240 200	Acid phosphate .... Kainit	616	169	368	33	552	192	520	181
8	00	No fertilizer	452		328		344		336	
9	200 240 200	Cotton seed meal ... Acid phosphate .... Kainit	792	340	416	88	648	304	696	360
10	200 240 100	Cotton seed meal ... Acid phosphate .... Kainit	880	428	448	120	594	250	688	352

EXPERIMENT MADE IN 1901 BY CLARENDON DAVIS, HUNTSVILLE.

Red upland soil and subsoil, characteristic of the Tennessee valley.

Ths field had been in cultivation for many years. The preceding crop was wheat, itself preceded by cowpeas. Excessive shedding of forms, due to continued heavy rains in August, and the occurrence of light but damaging frost September 18th, reduced the yield on all plots, but more on the plots fertilized heavily and on those receiving cotton seed meal. The early frost and the residual fertilizing effects of the cowpeas probably explain the slight effects of cotton seed meal, to which in combination with acid phosphate, cotton usually responds profitably on this grade of soil. For yield of seed cotton see page 24. That table shows that the increase in seed cotton per acre was as follows:

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

To unfertilized plot	—96 lbs.
To acid phosphate plot	58 lbs.
To kainit plot	—100 lbs.
To acid phosphate and kainit plot	171 lbs.
Average increase with cotton seed meal	**8. lbs.**

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

To unfertilized plot	96 lbs.
To cotton seed meal plot	250 lbs.
To kainit plot	91 lbs.
To cotton seed meal and kainit plot	362 lbs.
Average increase with acid phosphate	**199 lbs.**

Increase of seed cotton per acre when kainit was added:

To unfertilized plot	78 lbs.
To cotton seed meal plot	74 lbs.
To acid phosphate plot	73 lbs.
To cotton seed meal and acid phosphate plot	186 lbs.
Average increase with kainit	102 lbs.

The chief need of cotton on this soil was for acid phosphate. Although there was no rust, the addition of kainit to the phosphate was profitable. The conditions in this test did not give to cotton seed meal a fair opportunity to show the favorable effects that may usually be expected of it on this soil. Yet a complete fertilizer was the most profitable, plot 10 leading with a net profit of $6.90 per acre after paying for fertilizers and for picking and ginning the increase, on the basis of lint at 8 cents and cotton seed at 60 cents per hundred pounds.

Experiments Made in 1902, 1903, and 1904 by H. D. N. Wales, Huntsville.

Red clay soil and subsoil.

The excessively long dry period from April to August rendered all fertilizers ineffective in 1902. For yields and increase of crop see table on page 24. The 1903 experiment was preceded by two corn crops in succession. That year the largest yield resulted from the use of a mixture of acid phosphate and cotton seed meal. Kainit was of little or no use in combination, but on plot 4 it seemed useful when used alone. There was no rust. Mr. Wales thinks that early frost cut off one-half of the expected yields on plots 9 and 10, and did less injury on other plots.

In 1904 the experiment was on similar soil, that had borne a crop of cowpeas three years before and then had been uncultivated for two years. The largest yield was again obtained from plot 5, fertilized with 200 pounds of

cotton seed meal and 240 pounds acid phosphate. Mr. Wales added an eleventh plot fertilized with 200 pounds acid phosphate and 100 pounds cotton seed meal, the yield of which was 684 pounds, or practically as good as plots 9 and 10, containing kainit and a larger amount of cotton seed meal. Cotton seed meal was highly profitable when employed in combination, but less useful alone. Kainit was generally useless. In view of results recorded in this bulletin and in those obtained in previous experiments on typical red upland Tennessee valley soil, I would suggest as a general fertilizer for cotton on that soil

80 to 120 lbs. cotton seed meal per acre.
160 to 240 lbs acid phosphate per acre.

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240 to 360 lbs. total per acre.

If the cotton stalks grow very small it might be advisable to increase the proportion of cotton seed meal to one-half of the mixture.

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

	1902	1903	1904
To unfertilized plot	56 lbs.	216 lbs.	64 lbs.
To acid phosphate plot	13 lbs.	32 lbs.	405 lbs.
To kainit plot	67 lbs.	88 lbs.	367 lbs.
To acid phosphate and kainit plot	55 lbs.	112 lbs.	179 lbs.
Average increase with cotton seed meal	**47 lbs.**	**112 lbs.**	**253 lbs.**

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

To unfertilized plot	24 lbs.	288 lbs.	120 lbs.
To cotton sed meal plot	—19 lbs.	104 lbs.	462 lbs.
To kainit plot	—33 lbs.	0 lbs.	186 lbs.
To cotton seed meal and kainit plot	21 lbs.	24 lbs.	—2 lbs.
Average increase with acid phosphate	**14 lbs.**	**104 lbs.**	**167 lbs.**

Increase of seed cotton per acre when kainit was added:

To unfertilized plot	0 lbs.	192 lbs.	—5 lbs.
To cotton seed meal plot	11 lbs.	64 lbs.	298 lbs.
To acid phosphate plot	9 lbs.	96 lbs.	61 lbs.
To cotton seed meal and phosphate plot	51 lbs.	16 lbs.	—160 lbs.
Average increase with kainit	17 lbs.	92 lbs.	19 lbs.

Experiments Made by C. L. Jenkins, near Silver Run, Talladega County.

Most of the soil on this farm, six miles south of Oxford, is light reddish to yellowish loam, apparently fairly well supplied with lime.

In 1902. The preceding crop was wheat. No cowpeas had been grown in recent years. The early part of the season was very dry. All three fertilizer materials were useful, a complete fertilizer giving the largest yield.

In 1903. The largest yield was obtained by the use of a complete fertilizer consisting of

200 lbs. cotton seed meal per acre.
240 lbs acid phosphate per acre.
100 lbs kainit per acre.

In 1904. Again the largest yield was obtained by the complete formula just mentioned. Plot 5 this year, without kainit, yields almost as much as the plots with complete fertilizers. The first need of this soil seems to be for phosphate but nitrogen and potash were added with effect.

Silver Run experiments with cotton.

Plot No.	FERTILIZER. Amount per acre.	KIND.	Silver Run 1902 Yield of seed cotton per acre.	Silver Run 1902 Increase over unfertilized plots	Silver Run 1903 Yield of seed cotton per acre.	Silver Run 1903 Increase over unfertilized plots	Silver Run 1904 Yield of seed cotton per acre.	Silver Run 1904 Increase over unfertilized plots.
	Lbs		*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
1	200	Cotton seed meal	144	40	200	—80	576	48
2	240	Acid phosphate	184	80	392	112	544	16
3	00	No fertilizer	104		280		528	
4	200	Kainit	240	129	480	187	568	37
5	200 240	Cotton seed meal ... Acid phosphate	324	207	672	366	880	345
6	200 200	Cotton seed meal ... Kainit	356	233	568	249	696	158
7	240 200	Acid phosphate ..... Kainit	304	175	744	412	648	107
8		No fertilizer	136		344		544	
9	200 240 200	Cotton seed meal ... Acid phosphate ..... Kainit	492	356	776	432	880	336
10	200 240 100	Cotton seed meal ... Acid phosphate ..... Kainit	455	320	920	576	944	400

Increase of seed cotton when cotton seed meal was added:

	1902	1903	1904
To unfertilized plot	40 lbs.	80 lbs.	48 lbs.
To acid phosphate plot	127 lbs.	254 lbs.	329 lbs.
To kainit plot	104 lbs.	62 lbs.	121 lbs.
To acid phosphate and kainit plot	181 lbs.	20 lbs.	229 lbs.
Average increase with cotton seed meal..	**95 lbs.**	**64 lbs.**	**181 lbs.**

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

To unfertilized plot	80 lbs.	112 lbs.	16 lbs.
To cotton seed meal plot	167 lbs.	446 lbs.	297 lbs.
To kainit plot	46 lbs.	225 lbs.	70 lbs.
To cotton seed meal and kainit plot....	123 lbs.	183 lbs.	178 lbs.
Average increase with acid phosphate..	**106 lbs.**	**242 lbs.**	**140 lbs.**

Increase of seed cotton per acre when kainit was added:			
To unfertilized plot	129 lbs.	187 lbs.	37 lbs.
To cotton seed meal plot	193 lbs.	329 lbs.	110 lbs.
To acid phosphate plot	95 lbs.	300 lbs.	91 lbs.
To cotton seed meal and acid phos. plot	149 lbs.	66 lbs.	—9 lbs.
Average increase with kainit	**141 lbs.**	**221 lbs.**	**57 lbs.**

Experiments Made by W. F. Fulton, one Mile South of Colllinsville, DeKalb County.

Soil reddish or mullatto, subsoil red.

For table showing yields see page 31.

Both in 1902 and in 1903 the largest increase resulted from the use of cotton seed meal and acid phosphate together. Plainly kainit was not needed. Neither was cotton seed meal alone, nor phosphate alone, sufficient. This is the fifth fertilizer experiment with cotton that Mr. Fulton has made on the red soils of Big Wills Valley, the first at Larimore and the later tests at Collinsville. Each year the description of the soil is about the same, reddish valley soil, underlaid by red clay, and all apparently calcareous. These tests all agree in showing:

(1) That the chief need of cotton on this soil is for phosphate.

(2) That the addition of cotton seed meal to the acid phosphate is profitable.

(3) That in the presence of phosphate and meal kainit is useless.

The results suggest that the best fertilizer for these valley soils is one containing more phosphate than meal. I suggest 200 pounds acid phosphate and 100 pounds cotton seed meal. Earlier results are recorded in bulletins 102, 107 and 113 of this station. The following analysis shows the increase attributed to fertilizers in 1902 and 1903:

In none of the five experiments made by Mr. Fulton was there any injury by rust.

The average increase for the two years was on plot 5, receiving phosphate and meal, 348 pounds, affording a net profit per acre of $5.77 after paying cost of fertilizer and of ginning and picking the increase.

Collinsville and Montevallo experiments.

Plot No.	FERTILIZER. Amount per acre.	FERTILIZER. KIND.	Collinsville 1902. Yield of seed cotton per acre.	Collinsville 1902. Increase over unfertilized plots.	Collinsville 1903. Yield of seed cotton per acre.	Collinsville 1903. Increase over unfertilized plots.	Montevallo 1904. Yield of seed cotton per acre.	Montevallo 1904. Increase over unfertilized plots.
	Lbs		*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
1	200	Cotton seed meal	440	144	376	48	1056	192
2	240	Acid phosphtae	416	120	560	232	1000	146
3	00	No fertilizer	296		328		864	
4	200	Kainit	336	30	336	3	1056	144
5	200 240	Cotton seed meal ... Acid phosphtae	624	307	728	390	1072	112
6	200 200	Cotton seed meal ... Kainit			528	185	1208	300
7	240 200	Acid phosphtae .... Kainit	496	158	616	268	1384	328
8	00	No fertilizer	348		352		1104	
9	200 240 200	Cotton seed meal ... Acid phosphtae .... Kainit	544	196	712	360	1568	464
10	200 240 100	Cotton seed meal ... Acid phosphtae .... Kainit	512	164	712	360	1560	456

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

	1902	1903
To unfertilized plot	144 lbs.	48 lbs.
To acid phosphate plot	187 lbs.	158 lbs.
To kainit plot	—	182 lbs.
To acid phosphate and kainit plot	38 lbs.	92 lbs.
Average increase with cotton seed meal.....	123 lbs.	120 lbs.

Increase of seed cotton per acre when acid phosphate was added:		
To unfertilized plot	120 lbs.	232 lbs.
To cotton seed meal plot	163 lbs.	342 lbs.
To kainit plot	128 lbs.	265 lbs.
To cotton seed meal and kainit plot	—	175 lbs.
Average increase with acid phosphate	**137 lbs.**	**253 lbs.**

Increase of seed cotton per acre when kainit was added:		
To unfertilized plot	30 lbs.	3 lbs.
To cotton seed meal plot	—	137 lbs.
To acid phosphate plot	38 lbs.	36 lbs.
To cotton seed meal and acid phosphate plot	—111 lbs.	—31 lbs.
Average increase with kainit	**—14 lbs.**	**36 lbs.**

Experiment Made by J. W. Wyatt, Five Miles East of Montevallo, Shelby County.

Dark, reddish, sandy upland with red clay subsoil.

This field had been cleared of its second growth of timber for about fifteen years, and for about ten years in succession had been planted in cotton.

The original growth is reported to have been oak, hickory, chestnut and dogwood, and the second growth springing up when the land was thrown out of cultivation after the civil war was short leaf pine and sumac. No mention is made of rust.

The complete fertilizer raised the yield to more than a bale per acre, an increase of 464 pounds. The complete fertilizer with 100 pounds of kainit was more profitable than the one with a larger amount of kainit, the former affording a profit of $7.23 per acre after paying for fertilizer and picking and ginning of the increase.

Increase of seed cotton when cotton seed meal was added:

To unfertilized plot .....192 lbs.
To acid phosphate plot .....—34 lbs.
To kainit plot ..... 56 lbs.
To acid phosphate and kainit plot .....136 lbs.

Average increase with cotton seed meal..... 87 lbs.

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

To unfertilized plot .....146 lbs.
To cotton seed meal plot .....—80 lbs.
To kainit plot .....184 lbs.
To cotton seed meal and kainit plot.....264 lbs.

Average increase with acid phosphate .....128 lbs.

Increase of seed cotton per acre when kainit was added:

To unfertilized plot .....144 lbs.
To cotton seed meal plot ..... 8 lbs.
To acid phosphate plot .....182 lbs.
To cotton seed meal and acid phosphate plot..352 lbs.

Average increase with kainit .....171 lbs.

Experiment Made by G. R. Pass, Russellville, Franklin County.

This test was made on dark reddish clay upland with clay subsoil.

The original growth is described as oak and hickory with some wild cherry and walnut. Unfortunately for showing the full effects of cotton seed meal, the preceding crop was cowpeas, the entire growth being plowed under in the fall of 1903. The stand was good.

For yields and increase see table on page 36. The largest yield and the greatest profit per acre were obtained on plot 5, where only cotton seed meal and acid phosphate were employed. With this fertilizer the increase was 595 pounds per acre and the net profit, after paying for fertilizer and

picking and ginning of increase, was $11.59. Cotton seed meal was highly profitable in spite of the fact that the preceding pea crop had supplied a large amount of nitrogen. Kainit was useless, if not indeed injurious.

Increase of seed cotton when cotton seed meal was added:

To unfertilized plot	448 lbs.
To acid phosphate plot	323 lbs.
To kainit plot	163 lbs.
To acid phosphate and kainit plot	142 lbs.
Average increase with cotton seed meal	**244 lbs.**

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

To unfertilized plot	272 lbs.
To cotton seed meal plot	147 lbs.
To kainit plot	208 lbs.
To cotton seed meal and kainit plot	187 lbs.
Average increase with acid phosphate	**203 lbs.**

Increase of seed cotton per acre when kainit was added:

To unfertilized plot	42 lbs.
To cotton seed meal plot	—243 lbs.
To acid phosphate plot	—22 lbs.
To cotton seed meal and acid phosphate plot	—203 lbs.
Average decrease with kainit	**106 lbs.**

EXPERIMENT MADE BY L. LONG, LONG P. O., PERRY COUNTY, IN 1902.

Worn red prairie with some sand.

For yields and increase see table on page 36.

This soil had been uncultivated for several years, but had borne two crops of cotton just before the experiment was made. With a mixture of cotton seed meal and phosphate (plot 5) the increase was 360 pounds, affording a net profit of $5.48 per acre. Acid phosphate seems to have been the fertilizer chiefly needed, and the addition of cotton seed

meal to the phosphate was highly profitable. Kainit was unprofitable.

These results suggest that a suitable fertilizer for this soil might well contain more phosphate than meal, say two-thirds acid phosphate and one-third cotton seed meal. Mr. Long added an additional plot fertilized only with four 2-horse loads unweighed stable manure per acre. From this the increase over the nearest unfertilized plot was 188 pounds of seed cotton per acre.

Increase of seed cotton when cotton seed meal was added:

To unfertilized plot	104 lbs.
To acid phosphate plot	64 lbs.
To kainit plot	144 lbs.
To acid phosphate and kainit plot	112 lbs.
Average increase with cotton seed meal	**106 lbs.**

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

To unfertilized plot	296 lbs.
To cotton seed meal plot	256 lbs.
To kainit plot	300 lbs.
To cotton seed meal and kainit plot	268 lbs.
Average increase with acid phosphate	**278 lbs.**

Increase of seed cotton per acre when kainit was added:

To unfertilized plot	4 lbs.
To cotton seed meal plot	44 lbs.
To acid phosphate plot	8 lbs.
To cotton seed meal and acid phosphate plot	56 lbs.
Average increase with kainit	**28 lbs.**

Russellville, Long, Tidmore and Cullman experiments.

Plot No.	FERTILIZER. Amount per acre.	KIND.	Russellville 1904		Long 1902		Tidmore 1901		Cullman 1904	
			Yield of seed cotton per acre.	Increase over unfertilized plots.	Yield of seed cotton per acre.	Increase over unfertilized plots.	Yield of seed cotton per acre.	Increase over unfertilized plots.	Yield of seed cotton per acre.	Increase over unfertilized plots
	Lbs.		*Lbs.*	*Lbs*	*Lbs.*	*Lbs.*	*Lbs*	*Lbs*	*Lbs*	*Lbs.*
1	200	Cotton seed meal	1112	448	296	104	32	32	536	104
2	240	Acid phosphate	936	272	488	296	52	232	576	144
3	00	No fertilizer	664		192		292		432	
4	200	Kainit	768	42	192	4	276	4	528	82
5	200 240	Cotton seed meal ... Acid phosphate	1384	595	544	36	688	436	896	435
6	200 200	Cotton seed meal ... Kainit	1056	205	328	148	488	256	816	341
7	240 200	Acid phosphate ..... Kainit	1096	250	480	304	400	188	784	294
8	00	No fertilizer	976		172		192		504	
9	200 240 200	Cotton seed meal ... Acid phosphate ..... Kainit	1308	392	588	416	752	560	864	360
10	200 240 100	Cotton seed meal ... Acid phosphate ..... Kainit	1424	448	468	296	796	604	904	400

EXPERIMENT MADE BY JNO. W. STAAB, TWO MILES NORTH OF TIDMORE, BLOUNT COUNTY.

Light, gray, sandy soil with red loam subsoil 4 to 6 inches below the surface.

This upland field had been in cultivation about fifty years. The original growth is reported as shortleaf pine, gum, mountain oak, persimmon, and hickory. All plots were thinned to the same number of plants. For yields and increase see table on page 36. A complete fertilizer containing 100 pounds of kainit gave the largest increase, and a net profit of $11.07 per acre. A mixture of cotton seed meal and phosphate was also highly profitable.

The conclusions drawn by Mr. Staab from this experiment and from previous experience are here quoted:

"1. That 50 to 100 pounds of fertilizer per acre is not sufficient to mature a full crop.

2. That even the heavy applications do not pay unless the ground contains considerable humus.

3. That phosphatic fertilizers in connection with cotton seed meal or cowpeas, or weeds turned under green will pay better than nine-tenths of the fertilizers commonly used.

4. That heavy applications help crops into quick germination and more rapid growth, lessening expense for hoeing.

5. That a reduction of acreage and adequate increase of manures are advisable.

6. I do not find kainit of nearly the value it is advertised; in times of drought it shows for itself by the wilting of foliage. This is ameliorated by a mixture of cotton seed meal and acid phosphate."

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

To unfertilized plot	32 lbs.
To acid phosphate plot	204 lbs.
To kainit plot	252 lbs.
To acid phosphate and kainit plot	372 lbs.
Average increase with cotton seed meal	**215 lbs.**

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

To unfertilized plot	232 lbs.
To cotton seed meal plot	404 lbs.
To kainit plot	184 lbs.
To cotton seed meal and kainit plot	304 lbs.
Average increase with acid phosphate	**282 lbs.**

Increase of seed cotton per acre when kainit was added:

To unfertilized plot	4 lbs.
To cotton seed meal plot	224 lbs.
To acid phosphate plot	—44 lbs.
To cotton seed meal and acid phosphate plot	124 lbs.
Average increase with kainit	**77 lbs.**

Experiment Made at Cullman in 1904.

This experiment was conducted by Mr. Feirtag for Mr. L. A. Fealy. The land is described as very poor and the test as entirely fair. The soil is not described but was probably the characteristic sandy soil of that region. For yields and increase see table on page 36. The largest increase and the greatest profit were obtained on plot 5 from a mixture of acid phosphate and cotton seed meal, the net profit there being $7.43 per acre.

Increase of seed cotton when cotton seed meal was added:

To unfertilized plot	104 lbs.
To acid phosphate plot	291 lbs.
To kainit plot	259 lbs.
To acid phosphate and kainit plot	66 lbs.
Average increase with cotton seed meal	**180 lbs.**

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

To unfertilized plot	144 lbs.
To cotton seed meal plot	331 lbs.
To kainit plot	212 lbs.
To cotton seed meal and kainit plot	19 lbs.
Average increase with acid phosphate	**176 lbs.**

Increase of seed cotton per acre when kainit was added:

To unfertilized plot	82 lbs.
To cotton seed meal plot	237 lbs.
To acid phosphate plot	150 lbs.
To cotton seed meal and acid phosphate plot	—75 lbs.
Average increase with kainit	**98 lbs.**

EXPERIMENT MADE BY J. W. FRENCH, 3½ MILES NORTH OF GORDO, PICKENS COUNTY, IN 1901.

Gray, sandy upland with yellow clay subsoil.

The original growth is reported as shortleaf pine and sweet gum, which had been removed about twenty years before. On this soil cotton sometimes rusts, but there was no rust on plots fertilized with kainit in 1901. The season was dry.

Gordo, Tuscaloosa, and Hamilton experiments.

Plot No.	FERTILIZER.		GORDO 1901		GORDO 1902		TUSCALOOSA 1901		HAMILTON 1903	
	Amount per acre	KIND.	Yield of seed cotton per acre.	Increase over unfertilized plots.	Yield of seed cotton per acre.	Increase over unfertilized plots.	Yield of seed cotton per acre.	Increase over unfertilized plots.	Yield of seed cotton per acre.	Increase over unfertilized plots.
	Lbs.		*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
1	200	Cotton seed meal	512	144	656	120	552	104	745	155
2	240	Acid phosphate	448	80	680	144	592	144	780	190
3	00	No fertilizer	368		536		448		590	
4	200	Kainit	432	87	536	00	416	—39	600	10
5	200 240	Cotton seed meal ... Acid phosphate	568	45ε	808	272	812	351	870	280
6	200 200	Cotton seed meal ... Kainit	592	272	640	104	702	532	840	250
7	240 200	Acid phosphate ..... Kainit	536	91	800	64	696	223	810	220
8	00	No fertilizer	256		536		480			
9	200 240 200	Cotton seed meal ... Acid phosphate ..... Kainit	616	360	896	360	960	480	980	390
10	200 240 100	Cotton seed meal ... Acid phosphate ..... Kainit	608	352	848	312	792	231	870	280

A complete fertilizer gave the best yield. In a complete fertilizer 100 pounds of kainit was sufficient, plot 10 affording a net profit of $4.52.

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

To unfertilized plot .....144 lbs.
To acid phosphate plot .....165 lbs.
To kainit plot .....185 lbs.
To acid phosphate and kainit plot ..... 69 lbs.

Average increase with cotton seed meal.....181 lbs.

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

To unfertilized plot ..... 80 lbs.
To cotton seed meal plot .....101 lbs.
To kainit plot .....204 lbs.
To cotton seed meal and kainit plot ..... 88 lbs.

Average increase with acid phosphate .....118 lbs.

Increase of seed cotton per acre when kainit was added:

To unfertilized plot ..... 87 lbs.
To cotton seed meal plot .....121 lbs.
To acid phosphate plot .....211 lbs.
To cotton seed meal and acid phosphate plot ..115 lbs.

Average increase with kainit .....133 lbs.

EXPERIMENT MADE BY D. W. DAVIS, 1½ MILES NORTHEAST OF GORDO, PICKENS COUNTY, IN 1902.

Snuff colored, sandy clay loam with dark reddish clay subsoil.

This upland field had been in cultivation for many years, the two preceding crops being corn with a scant growth of cowpeas between the rows. The original growth was red oak, black jack oak, hickory and pine. The stand was uniform. For yield and increase see table on page 39.

A complete fertilizer gave the largest yield and a net profit on plot 9 of $3.96 per acre. While all three fertilizers were beneficial, the chief need was for phosphate. Preceding crops of cowpeas obscured the results from cotton seed

meal. Kainit, though useful, was less needed than it was the preceding year on the apparently lighter soil of Mr. French's farm.

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

To unfertilized plot	120 lbs.
To acid phosphate plot	128 lbs.
To kainit plot	104 lbs.
To acid phosphate and kainit plot	96 lbs.
Average increase with cotton seed meal	**112 lbs.**

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

To unfertilized plot	144 lbs.
To cotton seed meal plot	152 lbs.
To kainit plot	264 lbs.
To cotton seed meal and kainit plot	256 lbs.
Average increase with acid phosphate	**204 lbs.**

Increase of seed cotton per acre when kainit was added:

To unfertilized plot	00 lbs.
To cotton seed meal plot	—16 lbs.
To acid phosphate plot	120 lbs.
To cotton seed meal and acid phosphate plot	88 lbs.
Average increase with kainit	**64 lbs.**

EXPERIMENT CONDUCTED BY E. J. DAFFIN, 3½ MILES SOUTH OF TUSCALOOSA, IN 1901.

Gray, sandy soil, with yellow subsoil.

This field had been cleared about sixty years. The original growth is reported as oak, hickory, shortleaf pine, sweet gum, elm, mulberry, poplar and beech.

Black rust was severe on all plots. The season was dry until August, when excessive rains occurred.. The stands were very thin, but uniform on each plot.

The largest yield was made with the complete fertilizer. Six hundred and forty pounds of a complete fertilizer on

plot 9 increased the yield 480 pounds of seed cotton, affording (at 8 cents for lint) a net profit of $7.10 per acre after paying for fertilizers and cost of ginning and picking the increase. Cotton seed meal was important, and phosphate equally so; kainit was useful, but less needed than the other two, and was effective only when combined with one or both of the others.

The results of the 1901 test are in accord with similar experiments made by Mr. Daffin in 1900 on the same farm, (property of Hon. F. S. Moody) and with those obtained by him in 1897 and 1898 on the county Poor-house farm.

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

To unfertilized plot	104 lbs.
To acid phosphate plot	207 lbs.
To kainit plot	292 lbs.
To acid phosphate and kainit plot	257 lbs.
Average increase with cotton seed meal	**215 lbs.**

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

To unfertilized plot	144 lbs.
To cotton seed meal plot	247 lbs.
To kainit plot	262 lbs.
To cotton seed meal and kainit plot	227 lbs.
Average increase with acid phosphate	**220 lbs.**

Increase of seed cotton per acre when kainit was added:

To unfertilized plot	—39 lbs.
To cotton seed meal plot	149 lbs.
To acid phosphate plot	79 lbs.
To cotton seed meal and acid phosphate plot	129 lbs.
Average increase with kainit	**79 lbs.**

We may safely conclude that on soils of this character near Tuscaloosa cotton requires a large proportion of phosphate, considerable cotton seed meal, and less of kainit than of either meal or phosphate.

For yields and increase see table on page 39.

EXPERIMENT CONDUCTED BY THE SIXTH DISTRICT AGRICULTURAL SCHOOL AT HAMILTON, MARION COUNTY, IN 1903.

Soil dark loam with light red subsoil.

This upland soil had been cleared many years, then thrown out of cultivation, and again taken into cultivation five years before the test began.

On plots 7, 9 and 10 the stand was imperfect. The largest yield was made with the complete fertilizer, but potash was less needful than either cotton seed meal or phosphate.

The largest net profit, on plot 9, was $3.46.

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

To unfertilized plot	155 lbs.
To acid phosphate plot	90 lbs.
To kainit plot	240 lbs.
To acid phosphate and kainit plot	170 lbs.
Average increase with cotton seed meal	**163 lbs.**

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

To unfertilized plot	190 lbs.
To cotton seed meal plot	125 lbs.
To kainit plot	210 lbs.
To cotton seed meal and kainit plot	140 lbs.
Average increase with acid phosphate	**166 lbs.**

Increase of seed cotton per acre when kainit was added:

To unfertilized plot	10 lbs.
To cotton seed meal plot	95 lbs.
To acid phosphate plot	30 lbs.
To cotton seed meal and acid phosphate plot	110 lbs.
Average increase with kainit	**61 lbs.**

Experiment Made by Fifth District Agricultural School, Wetumpka, in 1901.

Dark gray loam soil with reddish subsoil.

This upland field is reported as having been cleared about twenty years before of its growth of longleaf pines and small water oaks.

For the three years preceding the experiment it was uncultivated and grew up in grass and briers.

There was little or no black rust. The stand was uniform.

The average results indicate that the chief need was for phosphate. Neither kainit nor cotton seed meal was of much use the first year after the plowing in of large amounts of vegetable matter,. The need for phosphate is also suggested by the results of the 1903 inconclusive experiment on the same farm. See pages 47 and 71.

The largest net profit was from plot 5, $4.65.

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

To unfertilized plot	64 lbs.
To acid phosphate plot	116 lbs.
To kainit plot	63 lbs.
To acid phosphate and kainit plot	—93 lbs.
Average increase with cotton seed meal	**37 lbs.**

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

To unfertilized plot	170 lbs.
To cotton seed meal plot	222 lbs.
To kainit plot	234 lbs.
To cotton seed meal and kainit plot	78 lbs.
Average increase with acid phosphate	**176 lbs.**

Increase of seed cotton per acre when kainit was added:

To unfertilized plot	67 lbs.
To cotton seed meal plot	66 lbs.
To acid phosphate plot	131 lbs.
To cotton seed meal and acid phosphate plot	—78 lbs.
Average increase with kainit	**46 lbs.**

EXPERIMENT MADE BY J. D. BILLINGSLEY, FIVE MILES WEST OF TALLASSEE, IN ELMORE COUNTY, IN 1903.

Black sandy upland; light colored subsoil.

The original growth of longleaf pine and oak had been removed about thirty years before. There was no rust and very little shedding. All plots were thinned to the same number of plants, namely, 5,760 per acre.

The rainfall was favorable. For yields see page 47.

The largest yield was obtained from the complete fertilizer which afforded an increase of 552 pounds of seed cotton per acre, or a net profit on plot 6 of $8.97, and on plot 10 of $9.67. The principal need was for potash and nitrogen, this being one of the few soils where, in the absence of rust, kainit was more important than acid phosphate.

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

To unfertilized plot	136 lbs.
To acid phosphate plot	204 lbs.
To kainit plot	470 lbs.
To acid phosphate and kainit plot	225 lbs.
Average increase with cotton seed meal	**258 lbs.**

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

To unfertilized plot	40 lbs.
To cotton seed meal plot	108 lbs.
To kainit plot	301 lbs.
To cotton seed meal and kainit plot	56 lbs.
Average increase with acid phosphate	**126 lbs.**

Increase of seed cotton per acre when kainit was added:

To unfertilized plot ..... 26 lbs.
To cotton seed meal plot .....360 lbs.
To acid phosphate plot .....287 lbs.
To cotton seed meal and acid phosphate plot ..308 lbs.

Average increase with kainit .....245 lbs.

EXPERIMENT MADE BY J. P. SLATON, SEVEN MILES SOUTH OF NOTASULGA.

This test was made on gray sandy hillside with stiffer reddish subsoil.

The original growth was longleaf pine, oak, hickory and gum, cleared eight years before. For two years preceding the experiment the land was pastured. Unfortunately the land was not plowed until May 17th, which delay reduced the yields. The stand was good on all plots. For yields and increase see table on page 47.

The complete fertilizer was most profitable, plot 9 giving an increase of 544 pounds of seed cotton per acre, equivalent to a net profit of $8.76 per acre.

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

To unfertilized plot .....256 lbs.
To acid phosphate plot .....105 lbs.
To kainit plot .....173 lbs.
To acid phosphate and kainit plot .....210 lbs.

Average increase with cotton seed meal .....186 lbs.

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

To unfertilized plot .....276 lbs.
To cotton seed meal plot .....129 lbs.
To kainit plot .....128 lbs.
To cotton seed meal and kainit plot .....165 lbs.

Average increase with acid phosphate .....174 lbs

Increase of seed cotton per acre when kainit was added:

To unfertilized plot .....206 lbs
To cotton seed meal plot .....123 lbs.
To acid phosphate plot ..... . 58 lbs.
To cotton seed meal and acid phosphate plot..163 lbs.

Average increase with kainit .....137 lbs.

Wetumpka, Tallassee, Notasulga and Auburn fertilizer experiments.

Plot No.	FERTILIZER. Amount per acre.	FERTILIZER. KIND.	Wetumpka 1901. Yield of seed cotton per acre.	Wetumpka 1901. Increase over unfertilized plots.	Tallassee 1903. Yield of seed cotton per acre.	Tallassee 1903. Increase over unfertilized plots.	Notasulga 1904. Yield of seed cotton per acre.	Notasulga 1904. Increase over unfertilized plots.	Auburn 1902. Yield of seed cotton per acre.	Auburn 1902. Increase over unfertilized plots.
	Lbs.		*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
1	200	Cotton seed meal	424	64	480	136	528	256	594	178
2	240	Acid phosphate	536	170	384	40	548	276	477	63
3	00	No fertilizer	360		344		272		416	
4	200	Kainit	432	67	376	26	472	206	629	201
5	200 240	Cotton seed meal ... Acid phosphate	656	286	600	244	640	381	580	140
6	200 200	Cotton seed meal ... Kainit	504	130	832	469	632	379	662	211
7	240 200	Acid phosphate ..... Kainit	680	301	696	327	580	334	648	185
8	00	No fertilizer	384		376		240		475	
9	200 240 200	Cotton seed meal .... Acid phosphate ..... Kainit	592	208	928	552	784	544	741	266
10	200 240 100	Cotton seed meal ... Acid phosphate ..... Kainit	664	280	926	550	564	324	729	254

EXPERIMENT ON STATION FARM AT AUBURN, IN 1902.

Light, sandy soil with porous sandy subsoil.

This test was made on the poorest hilltop on the station

farm where no leguminous crop had grown for a number of years. The absence of any considerable rain between April and August ruined the yield.

The stand was uniform on all plots. The chief need of this sand bank this excessively dry year was for kainit, but the largest yield was from complete fertilizer.

EXPERIMENT CONDUCTED BY W. T. CHISM, IN 1901, 1902 AND 1903, AT VICK, BIBB COUNTY.

Grayish, sandy, second bottom with yellow subsoil.

This land has been long in cultivation. On adjacent, similar land the forest growth consists of shortleaf pine, white and red oaks, gum, cucumber tree, dogwood, hickory and beech. For yields and increase see table on page 49.

In 1901. All plots were reduced to the same number of plants, 6,400 per acre. The two preceding crops had been cotton. The largest increase, 388 pounds of seed cotton per acre, or a net profit of $5.31 per acre, was obtained where a complete fertilizer was used. This year nitrogen was apparently the plant food chiefly needed, but both phosphoric acid and potash were advantageous. There was practically no rust on any plot.

In 1902. Dry weather, almost continuous from April till August, made the yields on all plots low and all fertilizers practically useless.

In 1903. The two preceding crops had been cotton. The spring was late and cold. No rust occurred. As in 1901 cotton seed meal greatly increased the yield while phosphate and kainit were less important, but advantageous. Plot 10 afforded the largest increase, 446 pounds, or a net profit of $6.19 per acre.

The results suggest that the phosphate in the complete fertilizer might have been much reduced without injury to the crop.

Mr. Chism also made similar experiments in 1899 and 1900. In those years cotton seed meal was the only fertilizer that was of material advantage. The results as a whole indicate that on this second bottom a fertilizer of unusual composition is required and that it should contain more of cotton seed meal than of any other fertilizer.

Experiments at Vick, Bibb county.

Plot No.	FERTILIZER. Amount per acre.	FERTILIZER. KIND.	VICK 1901. Yield of seed cotton per acre.	VICK 1901. Increase over unfertilized plots	VICK 1902. Yield of seed cotton per acre.	VICK 1902. Increase over unfertilized plots	VICK 1903. Yield of seed cotton per acre.	VICK 1903. Increase over unfertilized plots
	Lbs.		*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
1	200	Cotton seed meal	676	122	352	48	864	242
2	240	Acid phosphate	612	128	360	56	572	—50
3	00	No fertilizer	484		304		622	
4	200	Kainit	636	156	364	57	700	75
5	200 240	Cotton seed meal ... Acid phosphate	732	256	412	102	970	348
6	200 200	Cotton seed meal ... Kainit	740	268	400	86	940	310
7	240 200	Acid phosphate ..... Kainit	716	248	432	115	752	119
8	00	No fertilizer	464		320		636	
9	200 240 200	Cotton seed meal ... Acid phosphate ..... Kainit	852	388	432	112	1024	388
10	200 240 100	Cotton seed meal ... Acid phosphate ..... Kainit	728	264	428	108	1052	416

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

	1901	1903
To unfertilized plot	192 lbs.	242 lbs.
To acid phosphate plot	128 lbs.	398 lbs.
To kainit plot	112 lbs.	235 lbs.
To acid phosphate and kainit plot	140 lbs.	262 lbs.
Average increase with cotton seed meal.....	143 lbs.	284 lbs.

Increase of seed cotton per acre when acid phosphate was added:		
To unfertilized plot	128 lbs.	50 lbs.
To cotton seed meal plot	64 lbs.	106 lbs.
To kainit plot	92 lbs.	44 lbs.
To cotton seed meal and kainit plot	120 lbs.	84 lbs.
Average increase with acid phosphate	**101 lbs.**	**46 lbs.**
Increase of seed cotton per acre when kainit was added:		
To unfertilized plot	156 lbs.	75 lbs.
To cotton seed meal plot	76 lbs.	68 lbs.
To acid phosphate plot	120 lbs.	189 lbs.
To cotton seed meal and acid phosphate plot	132 lbs.	40 lbs.
Average increase with kainit	**121 lbs.**	**88 lbs.**

EXPERIMENT MADE BY THE SOUTHERN INDUSTRIAL INSTITUTE, CAMP HILL, TALLAPOOSA COUNTY, IN 1902.

Gray, sandy soil, with sandy subsoil.

A protracted drought made all fertilizers practically useless, the average increase from cotton seed meal being only 18 pounds, from phosphate 31 pounds, and from kainit 17 pounds. The most favorable result, on plot 7, entailed a loss on account of fertilizers of 94 cents per acre.

EXPERIMENTS MADE 2½ MILES SOUTH OF HANOVER, COOSA COUNTY, BY J. M. LOGAN, IN 1902.

Dark gray sandy soil with some rock; yellowish subsoil.

The original growth, removed about 40 years before, consisted of longleaf pine, hickory and oak. Recent crops have all been cotton. The largest increase, 392 pounds of seed cotton per acre, was obtained from the use of a complete fertilizer, affording a net profit of $5.56 per acre. Phosphate used alone or with kainit, was of little value, but combined with both it was highly advantageous.

Camp Hill, Hanover, Florence and Athens experiments.

Plot No.	FERTILIZER. Amount per acre.	KIND.	CAMP HILL 1902 Yield of seed cotton per acre.	CAMP HILL 1902 Increase over unfertilized plots.	HANOVER 1903 Yield of seed cotton per acre.	HANOVER 1903 Increase over unfertilized plots.	FLORENCE 1904 Yield of seed cotton per acre.	FLORENCE 1904 Increase over unfertilized plots.	ATHENS 1904 Yield of seed cotton per acre.	ATHENS 1904 Increase over unfertilized plots.
	Lbs.		*Lbs.*	*Lbs.*	*Lbs.*	*Lbs*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
1	200	Cotton seed meal	576	32	360	120	732	284	560	208
2	240	Acid phosphate	536	—8	264	24	1144	696	600	248
3	00	No fertilizer	544		240		448		352	
4	200	Kainit	528	—15	376	137	784	334	656	295
5	200	Cotton seed meal ...	584	43	352	116	1416	965	728	357
	240	Acid phosphate								
6	200	Cotton seed meal ...	656	27	368	132	1024	571	760	379
	200	Kainit								
7	240	Acid phosphate	624	86	384	151	1272	828	592	201
	200	Kainit								
8	00	No fertilizer	536		232		456		400	
9	200	Cotton seed meal ...	576	40	536	304	1492	1036	816	416
	240	Acid phosphate								
	200	Kainit								
10	200	Cotton seed meal ...	536	00	624	392	1200	744	872	472
	240	Acid phosphate								
	100	Kainit								

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

To unfertilized plot .....120 lbs.
To acid phosphate plot ..... 92 lbs.
To kainit plot ..... 4 lbs.
To acid phosphate and kainit plot .....153 lbs.

Average increase with cotton seed meal ..... 90 lbs.

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

To unfertilized plot ..... 24 lbs.
To cotton seed meal plot .....—4 lbs.
To kainit plot ..... 11 lbs.
To cotton seed meal and kainit plot .....171 lbs.

Average increase with acid phosphate ..... 50 lbs.

Increase of seed cotton per acre when kainit was added:

To unfertilized plot	136 lbs.
To cotton seed meal plot	13 lbs.
To acid phosphate plot	127 lbs.
To cotton seed meal and acid phosphate plot	188 lbs.
Average increase with kainit	**113 lbs.**

EXPERIMENT MADE BY W. A. PARISH, TEN MILES WEST OF FLORENCE, LAUDERDALE COUNTY.

Light, gray soil with pale reddish subsoil.

This field had been cleared 40 or 50 years. The original growth is reported as postoak and black jack oak.

The experimenter reports that there was no black rust, but that "red rust" was present, but did little damage. The season was dry. The stand was good and uniform.

The complete fertilizer more than trebled the yield of the unfertilized plots, raising the yield to about a bale per acre. This is an increase of 1,036 pounds of seed cotton, equal to a net profit of $21.56 per acre after paying for fertilizer and picking and ginning of increase. Every fertilizer, whether applied singly, by twos, or all three together, profitably increased the yield. The fertilizer most needed was phosphate. The one least needed was kainit which, however, was profitable.

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

To unfertilized plot	284 lbs.
To acid phosphate plot	269 lbs.
To kainit plot	237 lbs.
To acid phosphate and kainit plot	208 lbs.
Average increase with cotton seed meal	**249 lbs.**

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

To unfertilized plot	696 lbs.
To cotton seed meal plot	681 lbs.
To kainit plot	494 lbs.
To cotton seed meal and kainit plot	465 lbs.
Average increase with acid phosphate	**584 lbs.**

Increase of seed cotton per acre when kainit was added:

To unfertilized plot	334 lbs.
To cotton seed meal plot	287 lbs.
To acid phosphate plot	132 lbs.
To cotton seed meal and acid phosphate plot	71 lbs.
Average increase with kainit	**212 lbs.**

Experiment Made by P. G. Williams, 1½ Miles West of Athens, Limestone County.

Dark brown loam or clay with red subsoil.

This field had been cleared many years. The original growth is reported as oak, black jack oak, gum and popuar.

There was no rust, but drought and early frost cut short the yield. The most profitable fertilizer was the complete one containing 100 pounds of kainit. With this the increase was 472 pounds of seed cotton per acre, thus affording a net profit above the cost of fertilizer and picking and ginning of increase of $7.64 per acre. However, all fertilizers whether applied singly, by twos, or by threes, profitably increased the yield.

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

To unfertilized plot	208 lbs.
To acid phosphate plot	109 lbs.
To kainit plot	84 lbs.
To acid phosphate and kainit plot	215 lbs.
Average increase with cotton seed meal	**154 lbs.**

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

To unfertilized plot	284 lbs.
To cotton seed meal plot	149 lbs.
To kainit plot	—34 lbs.
To cotton seed meal and kainit plot	37 lbs
Average increase with acid phosphate	**85 lbs.**

Increase of seed cotton per acre when kainit was added:

To unfertilized plot	295 lbs.
To cotton seed meal plot	171 lbs.
To acid phosphate plot	—47 lbs.
To cotton seed meal and acid phosphate plot	59 lbs.
Average increase with kainit	**119 lbs.**

Experiments by W. G. Bevill, Naheola, Choctaw County, in 1901 and 1902.

"Mulatto" upland with clay subsoil.

The land had been long in cultivation. The original growth was reported as both long and shortleaf pine. The immediately preceding crops were cotton.

For yields see table on page ——

Rust was worst on plot 5, but there was little of it on the kainit plots. Dry weather from June to August, followed by a violent storm, greatly reduced the yield. The stand was good.

In 1901. The largest increase, 448 pounds of seed cotton per acre, was from a complete fertilizer. However, in a complete fertilizer, 100 pounds of kainit was sufficient; plot 9 afforded a net profit of $8.13 per acre.

In 1902. In spite of the drought from April till August, cotton seed meal and acid phosphate profitably increased the yield. Plot 5 afforded an increase of 247 pounds, or a net profit of $2.54, or a few cents less than plot 10 and a few cents less than plot 9.

Nahcola, Greenville, and Evergreen experiments.

Plot No.	FERTILIZER. Amount per acre.	KIND.	NAHEOLA 1901 Yield of seed cotton per acre.	NAHEOLA 1901 Increase over unfertilized plots.	NAHEOLA 1902 Yield of seed cotton per acre.	NAHEOLA 1902 Increase over unfertilized plots.	GR'ENVILLE 1901 Yield of seed cotton per acre.	GR'ENVILLE 1901 Increase over unfertilized plots.	EVERGREEN 1902 Yield of seed cotton per acre.	EVERGREEN 1902 Increase over unfertilized plots.
	Lbs		*Lbs*	*Lbs*	*Lbs*	*Lbs*	*Lbs*	*Lbs*	*Lbs*	*Lbs*
1	200	Cotton seed meal	648	120	400	-32	632	304	384	80
2	240	Acid phosphate	664	136	504	72	616	288	384	80
3	00	No fertilizer	528		432		328		304	
4	200	Kainit	664	130	296	-141	352	24	224	-64
5	200 240	Cotton seed meal ... Acid phosphate	760	220	688	247	696	268	672	400
6	200 200	Cotton seed meal ... Kainit	856	310	616	170	664	326	696	440
7	240 200	Acid phosphate ..... Kainit	696	143	600	149	528	200	688	448
8	00	No fertilizer	560		456				224	
9	200 240 200	Cotton seed meal ... Acid phosphate ..... Kainit	1008	448	744	288	632	304	800	592
10	200 240 100	Cotton seed meal ... Acid phosphate ..... Kainit	1000	440	744	288	784	456	768	576

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

	1901	1902
To unfertilized plot	120 lbs.	—32 lbs.
To acid phosphate plot	84 lbs.	175 lbs.
To kainit plot	180 lbs.	311 lbs.
To acid phosphate and kainit plot	305 lbs.	139 lbs.
Average increase with cotton seed meal.....	**172 lbs.**	**145 lbs.**

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

To unfertilized plot	136 lbs.	72 lbs.
To cotton seed meal plot	100 lbs.	279 lbs.
To kainit plot	13 lbs.	290 lbs.
To cotton seed meal and kainit plot	138 lbs.	118 lbs.
Average increase with acid phosphate	**96 lbs.**	**189 lbs.**

Increase of seed cotton per acre when kainit was added:

To unfertilized plot	130 lbs.	—141 lbs.
To cotton seed meal plot	190 lbs.	202 lbs.
To acid phosphate plot	7 lbs.	75 lbs.
To cotton seed meal and acid phosphate plot	228 lbs.	41 lbs.
Average increase with kainit	**138 lbs.**	**44 lbs.**

EXPERIMENT BY D. H. ROUSE, GREENVILLE, IN 1901.

Worn, red land.

The average increase is the greatest with cotton seed meal, 172 pounds of seed cotton per acre, and next with acid phosphate. Kainit was ineffective. This test is not entirely conclusive.

For table of yields see page 55.

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

To unfertilized plot	304 lbs.
To acid phosphate plot	—20 lbs.
To kainit plot	302 lbs.
To acid phosphate and kainit plot	104 lbs.
Average increase with cotton seed meal	**172 lbs.**

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

To unfertilized plot	288 lbs.
To cotton seed meal plot	—36 lbs.
To kainit plot	176 lbs.
To cotton seed meal and kainit plot	—22 lbs.
Average increase with acid phosphate	**101 lbs.**

Increase of seed cotton per acre when kainit was added:

To unfertiized plot	24 lbs.
To cotton seed meal plot	22 lbs.
To acid phosphate plot	—88 lbs.
To cotton seed meal and acid phosphate plot	36 lbs.
Average decrease with kainit	**1 lbs.**

EXPERIMENT BY J. W. STUART, AT EVERGREEN, IN 1902.

Gray sandy upland with reddish subsoil.

For yields see page 55.

There was no rust. The stand was uniform. In spite of the severe drought every combination of fertilizers effected a highly profitable increase in the crop. However, when used separately, no fertilizer material exerted its full effect.

The largest increase, 592 pounds of seed cotton per acre, resulted from the use of a complete fertilizer, but in the complete fertilizer 100 pounds of kainit was nearly as effective as a larger amount. Plot 10 afforded a net profit of $10.34 per acre after paying for fertilizer and for picking and ginning the increase.

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

To unfertilized plot	80 lbs
To acid phosphate plot	320 lbs.
To kainit plot	504 lbs.
To acid phosphate and kainit plot	144 lbs.
Average increase with cotton seed meal	**264 lbs.**

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

To unfertilized plot	80 lbs.
To cotton seed meal plot	320 lbs.
To kainit plot	512 lbs.
To cotton seed meal and kainit plot	152 lbs.
Average increase with acid phosphate	**266 lbs.**

Increase of seed cotton per acre when kainit was added:

To unfertilized plot	—64 lbs.
To cotton seed meal plot	360 lbs.
To acid phosphate plot	368 lbs.
To cotton seed meal and acid phosphate plot	192 lbs.
Average increase with kainit	**214 lbs.**

EXPERIMENT CONDUCTED BY J. D. VEAL, THREE MILES NORTH OF LOUISVILLE, BARBOUR COUNTY.

Gray, sandy soil, with stiffer gray subsoil.

This upland field had been cleared of its growth of oak and hickory and longleaf pine about thirty years before. For the two years preceding this experiment corn was grown on this land, but whether cowpeas were grown between the corn rows was not stated.

The stand on all plots was good. A complete fertilizer afforded the largest increase in yield, 474 pounds of seed cotton per acre, a net profit of $6.94 per acre. The complete fertilizer with 200 pounds of kainit was a little more profitable than the one containing 100 pounds of kainit. This is a case in which the increased yield from kainit was not due to its influence on rust, for Mr. Veal reports that there was no rust on any plot. See table page 66.

The combination of acid phosphate and cotton seed meal was highly profitable, but less so than the complete fertilizers.

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

To unfertiized plot	48 lbs.
To acid phosphate plot	253 lbs.
To kainit plot	301 lbs.
To acid phosphate and kainit plot	242 lbs.
Average increase with cotton seed meal	**211 lbs.**

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

To unfertilized plot	120 lbs.
To cotton seed meal plot	325 lbs.
To kainit plot	268 lbs.
To cotton seed meal and kainit plot	209 lbs.
Average increase with acid phosphate	**230 lbs.**

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

To unfertilized plot	—34 lbs.
To cotton seed meal plot	219 lbs.
To acid phosphate plot	114 lbs.
To cotton seed meal and acid phosphate plot	103 lbs.
Average increase with kainit	100 lbs.

EXPERIMENT MADE BY C. A. HATCHER, TWO MILES SOUTHEAST OF ENTERPRISE, COFFEE COUNTY.

Gray, sandy loam, with stiff gray subsoil.

The longleaf pines had been cut on this field about 18 years before. There were 7,360 plants per acre on all plots. For yields and increase see table on page 60. The crop preceding the experiment was corn with cowpeas in the drill and peanuts between the corn rows. It is not stated whether the peanuts were consumed as usual by hogs on the land, or removed.

In spite of these preceding leguminous crops and of the fact that the corn had been fertilized with eight bushels of cotton seed per acre, the application of cotton seed meal to cotton was decidedly profitable. The material most needed was acid phosphate. The greatest increase in yield, 616 pounds of seed cotton worth $16.01 net, resulted from the use of 640 pounds of a complete fertilizer, and this complete fertilizer afforded a net profit of $10.63 per acre.

Kainit was distinctly advantageous and profitable whenever combined with acid phosphate. The complete fertilizer combining 200 pounds of kainit was more profitable than the one with 100 pounds.

No mention is made of rust.

Louisville, Enterprise, Georgiana, and Garland experiments.

Plot No.	FERTILIZER. Amount per acre.	KIND.	Louisville 1904 Yield of seed cotton per acre.	Louisville 1904 Increase over unfertilized plots.	Enterprise 1904 Yield of seed cotton per acre.	Enterprise 1904 Increase over unfertilized plots.	Georgiana 1904 Yield of seed cotton per acre.	Georgiana 1904 Increase over unfertilized plots.	Garland 1901 Yield of seed cotton per acre.	Garland 1901 Increase over unfertilized plots.
	Lbs		*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
1	200	Cotton seed meal	240	48	552	272	976	64	808	296
2	240	Acid phosphate	312	120	536	256	1112	200	960	448
3	00	No fertilizer	192		280		912		512	
4	200	Kainit	184	—34	304	24	976	70	560	51
5	200	Cotton seed meal ...	616	373	680	400	1264	364	952	446
	240	Acid phosphate								
6	200	Kainit	536	267	528	248	1184	291	640	137
	200	Cotton seed meal ...								
7	240	Acid phosphate	528	234	768	488	1096	210	936	437
	200	Kainit								
8	00	No fertilizer	320		280		880		496	
9	200	Cotton seed meal ...	796	476	896	616	264	384	1056	560
	240	Acid phosphate								
	200	Kainit								
10	200	Cotton seed meal ...	724	404	800	520	240	360	1016	520
	240	Acid phosphate								
	100	Kainit								

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

To unfertilized plot .....272 lbs.
To acid phosphate plot .....144 lbs.
To kainit plot .....224 lbs.
To acid phosphate and kainit plot .....128 lbs.

Average increase with cotton seed meal .....192 lbs.

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

To unfertilized plot .....256 lbs.
To cotton seed meal plot .....128 lbs.
To kainit plot .....464 lbs.
To cotton seed meal and kainit plot .....368 lbs.

Average increase with acid phosphate .....304 lbs.

Increase of seed cotton per acre when kainit was added:

To unfertilized plot	24 lbs.
To cotton seed meal plot	—24 lbs.
To acid phosphate plot	232 lbs.
To cotton seed meal and acid phosphate plot	216 lbs.
Average increase with kainit	**112 lbs.**

EXPERIMENTS MADE BY J. C. LEE, 1904, 1 1-4 MILES NORTH OF GEORGIANA.

Gray "pineywoods" upland with red clay subsoil.

The land had been cleared about ten years. The original growth was longleaf pine with some oak, hickory, and dogwood.

There had been no cowpeas on this land in recent years.

There was no rust, but shedding was severe. The stand was good and uniform. For yields see page 60. The most profitable increase, 364 pounds of seed cotton per acre, resulted from the use of cotton seed meal and acid phosphate. This mixture gave a net profit of $5.58 per acre. The addition of kainit to this mixture was not notably helpful. The chief need of this soil was for phosphate and not ful. The chief need of this soil was for phosphate and next

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

To unfertilized plot	64 lbs.
To acid phosphate plot	164 lbs.
To kainit plot	221 lbs.
To acid phosphate and kainit plot	174 lbs.
Average increase with cotton seed meal	**155 lbs.**

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

To unfertilized plot	200 lbs.
To cotton seed meal plot	300 lbs.
To kainit plot	140 lbs.
To cotton seed meal and kainit plot	193 lbs.
Average increase with acid phosphate	**208 lbs.**

Increase of seed cotton per acre when kainit was added:

To unfertilized plot	70 lbs.
To cotton seed meal plot	227 lbs.
To acid phosphate plot	10 lbs.
To cotton seed meal and acid phosphate plot	20 lbs.
Average increase with kainit	**81 lbs.**

EXPERIMENT MADE IN 1901, BY G. L. MCLURE, TWO MILES EAST OF GARLAND, BUTLER COUNTY.

This gray upland pine soil had been cleared about ten years. The original growth was longleaf pine and black jack oak. The preceding crop was oats. Acid phosphate was highly profitable and cotton seed meal effective. Kainit was effective only when combined with the other two. The largest increase, 560 pounds of seed cotton per acre, was obtained from the use of a complete fertilizer. This, on plot 9, gave a net profit of $9.46 per acre. For yield see table on page 60.

Two experiments previously made by Mr. McLure and two made near by at Lumber Mills, accord with the results here recorded in showing that the pineywoods soils of that region are highly responsive to a mixture of acid phosphate and cotton seed meal, and that kainit is highly beneficial only when rust is severe.

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

To unfertilized plot	296 lbs.
To acid phosphate plot	—2 lbs.
To kainit plot	86 lbs.
To acid phosphate and kainit plot	123 lbs.
Average increase with cotton seed meal	**125 lbs.**

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

To unfertilized plot	448 lbs.
To cotton seed meal plot	150 lbs.
To kainit plot	386 lbs.
To cotton seed meal and kainit plot	423 lbs.
Average increase with acid phosphate	**351 lbs.**

Increase of seed cotton per acre when kainit was added:

To unfertilized plot	51 lbs.
To cotton seed meal plot	—159 lbs.
To acid phosphate plot	—11 lbs.
To cotton seed meal and acid phosphate plot	114 lbs.
Average decrease with kainit	**1 lbs.**

Experiment Made by W. H. Simmons, Midland City, Dale County.

Alone none of the fertilizers was very advantageous, but in a complete fertilizer all three were decidedly beneficial. The largest increase, 296 pounds of seed cotton per acre, resulted from the use of the complete fertilizer on plot 9. This afforded a net profit of $2.32 per acre, which is nearly nine cents more than the profit on plot 10, where less kainit was used. See table on page 64.

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

To unfertilized plot	88 lbs.
To acid phosphate plot	127 lbs.
To kainit plot	86 lbs.
To acid phosphate and kainit plot	139 lbs.
Average increase with cotton seed meal	**110 lbs.**

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

To unfertilized plot ..... 56 lbs.
To cotton seed meal plot ..... 95 lbs.
To kainit plot .....113 lbs.
To cotton seed meal and kainit plot .....166 lbs.

Average increase with acid phosphate .....107 lbs.

Increase of seed cotton per acre when kainit was added:

To unfertilized plot ..... 44 lbs.
To cotton seed meal plot ..... 42 lbs.
To acid phosphate plot .....101 lbs.
To cotton seed meal and acid phosphate plot ..113 lbs.

Average increase with kainit ..... 75 lbs.

Midland City and Geneva experiments.

Plot No.	FERTILIZER. Amount per acre.	KIND.	Midland City 1904 Yield of seed cotton per acre.	Midland City 1904 Increase over unfertilized plots.	Geneva 1901 Yield of seed cotton per acre.	Geneva 1901 Increase over unfertilized plots.	Geneva 1902 Yield of seed cotton per acre.	Geneva 1902 Increase over unfertilized plots.	Geneva 1903 Yield of seed cotton per acre.	Geneva 1903 Increase over unfertilized plots.
	Lb.		*Lbs.*	*Lbs.*	*Lbs*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs*	*Lbs.*
1	200	Cotton seed meal	312	88	488	112	763	8	712	—8
2	240	Acid phosphate	280	56	672	295	880	120	768	48
3	00	No fertilizer	224		376		768		720	
4	200	Kainit	264	44	424	48	1088	359	856	166
5	200 240	Cotton seed meal ... Acid phosphate	400	183	600	224	1000	323	784	125
6	200 200	Cotton seed meal ... Kainit	344	130	448	72	1008	373	976	348
7	240 200	Acid phosphate .... Kainit	368	157	608	232	1016	423	840	242
8	00	No fertilizer	208		376		552		568	
9	200 240 200	Cotton seed meal ... Acid phosphate .... Kainit	504	296	640	264	1040	488	1096	523
10	200 240 100	Cotton seed meal ... Acid phosphate .... Kainit	472	264	600	224	912	360	928	360

Experiments by P. M. Metcalf, 4½ Miles North of Geneva.

Gray or light sandy upland with stiffer red subsoil, eight inches from surface.

For yields see table on pages 64 and 74.

In 1901. This was the fourth crop after clearing, all previous crops being corn with cowpeas and peanuts between. No mention is made of rust.

On this fresh land where leguminous crops had grown for several years, phosphate was the only material of marked value. Phosphate alone increased the yield 296 pounds of seed cotton per acre, affording a net profit of $6.02 per acre, after paying cost of fertilizer and picking and ginning of increase.

In 1902. The immediately preceding crop was oats, which in turn had been preceded by two crops of corn, probably with cowpeas or peanuts between, as is customary in that locality.

The time since clearing is not stated.

Protracted drought and abundance of cotton caterpillars in October reduced the yields. No mention is made of black rust, but Mr. Metcalf writes that "Plots 1, 2, 3, 4 and 8 had much of what we know as red rust." In this unfavorable year kainit was by far the most effective single fertilizer, increasing the yield when used alone 369 pounds. The complete fertilizer containing a full ration of kainit increased the yield 488 pounds of seed cotton, affording a net profit of $6.31 per acre.

Mr. Metcalf writes: "I learn from this experiment that it pays to use lots of guano and of high quality."

In 1903. This was the sixth year since the clearing of this land. The crops in 1902 were oats, followed by Spanish peanuts. There was no rust. This experiment is rendered inconclusive by the wide variation in the yields of

the two unfertilized plots and by the contradictory results on plots 9 and 10, hence it is recorded in the table on page 74.

In 1904. Cotton in this experiment constituted the fourth crop since clearing. The two preceding crops had been corn and peanuts, the peanuts not picked. The summer was dry. The largest increase, 528 pounds of seed cotton per acre, was made by the complete fertilizer, affording a net profit above cost of fertilizer, ginning and picking of $9.38 per acre.

Again the chief need seems to have been for kainit, acid phosphate being almost as important, and cotton seed meal somewhat less important by reason of recent crops of peanuts.

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

	1901	1902	1904
To unfertilized plot	112 lbs.	8 lbs.	— 8 lbs.
To acid phosphate plot	—72 lbs.	203 lbs.	77 lbs.
To kainit plot	24 lbs.	4 lbs.	182 lbs.
To acid phosphate and kainit plot	32 lbs.	65 lbs.	286 lbs.
Average increase with cotton seed meal	**24 lbs.**	**70 lbs.**	**136 lbs.**

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

To unfertilized plot	296 lbs.	120 lbs.	48 lbs.
To cotton seed meal plot	112 lbs.	315 lbs.	133 lbs.
To kainit plot	184 lbs.	54 lbs.	76 lbs.
To cotton seed meal and kainit plot	192 lbs.	25 lbs.	180 lbs.
Average increase with acid phosphate	**196 lbs.**	**128 lbs.**	**109 lbs.**

Increase of seed cotton per acre when kainit was added:

To unfertilized plot	48 lbs.	369 lbs.	166 lbs.
To cotton seed meal plot	—40 lbs.	365 lbs.	356 lbs.
To acid phosphate plot	—64 lbs.	303 lbs.	194 lbs.
To cotton seed meal and acid phos. plot	40 lbs.	165 lbs.	402 lbs.
Average increase with kainit	**—4 lbs.**	**300 lbs.**	**270 lbs.**

Do Fertilizers Pay?

Let the figures answer. The following table gives the average of all the 41 conclusive experiments recorded in this bulletin. It shows the average increase in seed cotton, due to fertilizers, throughout Alabama and the net profit due to fertilizers, after paying liberal prices for fertilizers and after paying 50 cents per hundred pounds of seed cotton for picking and ginning the increased yields.

Average increase in 41 experiments in seed cotton per acre and net profit per acre from fertilizers, after deducting cost of fertilizer and cost of picking and ginning the increase.

Plot No.	FERTILIZER. Amount per acre.	FERTILIZER. KIND.	Increase in seed cotton from fertilizers.	Net profit per acre from fertilizers with seed at 60c per 100 lbs. and Lint at 6c.	Lint at 8c.	Lint at 10c.
	Lbs.		*Lbs.*	$	$	$
2	240	Acid phosphate	55	1.26	2.35	3.36
5	200	Cotton seed meal ...	302	1.85	3.97	5.87
	240	Acid phosphate				
9	200	Cotton seed meal ...	91	2.04	4.78	7.25
	240	Acid phosphate				
	200	Kainit				
10	200	Cotton seed meal ...	365	2.30	4.86	7.26
	240	Acid phosphate				
	100	Kainit				

The above table deserves careful study. Even with cotton calculated at six cents per pound, fertilizers were profitable, the average net profit per acre ranging from $1.26 to $2.30.

With eight-cent cotton the average net profits from fertilizers assume important proportions, ranging from $2.35 and $4.86 per acre.

With ten cent cotton the average profits range between $3.36 and $7.26 per acre.

Whether cotton be priced at six, eight, or ten cents per pound, the average profit per acre was greater with a mixture of cotton seed meal and phosphate than with phosphate alone, and still greater when 100 pounds of kainit was added to this mixture, thus making a complete fertilizer.

Conclusions and Suggestions.

These are based on these experiments and on results published in former bulletins of this station.

1. In all soil belts, except perhaps on certain grades of rich prairie soil, where tests have been made with cotton under the direction of this station acid phosphate has been almost universally beneficial.

2. Kainit is less frequently needed than either acid phosphate or cotton seed meal, and a considerable proportion of the soils on which it has been most advantageous lie in the southern part of the State. On soils where cotton is especially liable to "black rust" and in all parts of the State in seasons when that disease is especially injurious, kainit is at its best. On most soils, containing much clay, it can be profitably dispensed with. Where needed, an application of 100 pounds per acre is usually sufficient for cotton.

3. Cotton seed meal is highly beneficial to cotton on a large proportion of the cultivated area of every soil belt in Alabama. Apparently it is universally needed on uplands except on (1) new grounds and (2) on soils containing considerable vegetable matter.

4. On old soils, as a rule, it is more profitable to employ for cotton a mixture of acid phosphate and cotton seed meal or of these two and kainit, than to use an equal money value of any one of them alone.

5. The usual basis for a fertilizer formula for cotton

in regions where commercial fertilizers are generally employed should be acid phosphate, of which 100 to 240 pounds should be used per acre, in addition to cotton seed meal or other nitrogenous fertilizer as necessary.

6. The proper proportion of cotton seed meal to acid phosphate in a fertilizer formula for cotton depends largely on the recent cropping and manuring of the field.

(a) Small stalks, (if not due to climatic influences, poor cultivation, etc.) are usually an indication that nitrogen (as in cotton seed meal), is needed.

(b) Excessive stalk or "weed growth" of cotton is an indication that nitrogen can be dispensed with wholly or partially.

(c) Phosphate hastens maturity.

(d) The fresher the land the less the need for nitrogen.

(e) A luxuriant growth of cowpeas just preceding cotton dispenses with the necessity for cotton seed meal, as does a recent heavy dressing with stable manure or cotton seed.

7. Nitrogen costs about three times as much as phosphoric acid or potash and hence most of it should be produced on the farm by growing soil-improving plants, (as cowpeas, velvet beans, vetch, crimson clover, etc.) and by increasing the number of livestock and the amount of stable manure saved.

8. In response to requests for recommendations of definite fertilizer formulas for cotton on different soils, the writer would tentatively suggest the following to be modified somewhat when the facts mentioned in paragraph 6 seem to require it:

(a) For red lime lands in North Alabama; for the red clay lands occupying a triangular area in the central portion of East Alabama—for the most part north of the Western Railway and east of the Coosa River—and for the stiffer non-calcareous soils of the northwestern and western part of the State:

80 to 120 lbs. cotton seed meal per acre.
160 to 240 lbs. acid phosphate per acre.

240 to 360 lbs. total per acre.

(b) For sandy soils in the eastern and central parts of the State:

80 to 120 lbs. cotton seed meal per acre.
160 to 240 lbs. acid phosphate per acre.
40 to 60 lbs. kainit per acre.

280 to 420 lbs. total per acre.

(c) For the level lands of the southern Longleaf Pine Region:

60 to 120 lbs. cotton seed meal per acre.
120 to 240 lbs. acid phosphate per acre.
60 to 80 lbs. kainit per acre.

240 to 440 lbs. total per acre.

(d) For any well drained soil in any part of the State on which cotton is known to be especially liable to black rust:

120 to 160 lbs. cotton seed meal per acre.
80 to 120 lbs. acid phosphate per acre.
80 to 120 lbs. kainit per acre.

280 to 400 lbs. total per acre.

9. The formulas suggested above contain approximately the following percentages of nitrogen (and its larger equivalent in ammonia), available phosphoric acid, and potash, using phosphate containing 12 1-2 per cent. of available phosphoric acid. A phosphate of higher grade is advisable.

FORMULA.	Per Cent. Nitrogen.....	Per Cent. Ammonia.....	Per Cent. Available Phosphoric Acid.....	Per Cent. Potash.....
(a) For certain red lands	2.3	2.8	9.3	0.6
(b) For certain sandy lands	2.0	2.4	8.0	2.3
(c) For low longleaf pine lands	1.9	2.3	7.6	2.8
(d) For "rusting" soils	3.0	3.6	4.8	4.3

10. On the lime soils of the Central Prairie Region commercial fertilizers are not generally used. Prairie soils are often in poor mechanical condition and need vegetable matter and drainage more than commercial fertilizers. The poorer soils often need both cotton seed meal and phosphate.

INCONCLUSIVE EXPERIMENTS.

These sometimes afford suggestions or hints which may serve to strengthen the conclusions derived from the more positive experiments previously recorded.

At Town Creek, one-quarter of a mile southeast of the town, Mr. A. A. Owens made the test on what he describes as white sandy land with yellowish subsoil. There was no rust, but drought. This experiment was undertaken by Mr. R. R. Reed, who turned the fertilizers over to Mr. Owens. The test is inconclusive for the reason of the tearing of one of the fertilizer sacks, probably that for plot 9.

The Newtonville experiment in Fayette county was made by G. W. Gravlee, but was vitiated by late germination and irregular stands.

The experiment at Hanover, Coosa county, was made by J. M. Logan on gray gravelly or rocky land with red clay subsoil. The results suggest that kainit was not needed.

The test one mile east of Fredonia, Chambers county, was made by E. W. Smart on dark upland with red subsoil. Inequalities in stand, due, he reports, to disease of the young

plants, vitiated the experiment. The results suggest that a mixture of cotton seed meal and acid phosphate was sufficient. Cowpeas in corn or after oats, and grazed, grew on the land in each of two years preceding the experiment.

Mr. W. A. Candler, Clanton, Chilton county, made the experiment on land where the preceding winter he had plowed in a very rank growth of cowpea vines, affording conditions unsuitable for a test of commercial fertilizers.

At Wetumpka, the test was made on the farm of the District Agricultural Schools with conflicting results both in 1902 and 1903.

At Greensboro the tests were made by T. K. Jones, 1 1-2 miles south of town on poor red upland, originally covered with hardwood. In 1902 manure was accidentally added to certain plots, and in 1904 the growth of grass ruined the experiment.

Four miles north of Union Springs Mr. N. Gachet made a test on light, reddish loam with red clay subsoil, where the original growth had been hardwoods. Variations in the stand destroyed the value of the experiment.

The test at Carson, Washington county, was consigned to Mr. R. D. Palmer. It was made on gray upland, pine land with yellow clay subsoil, two miles north of Carson. The results are somewhat conflicting.

For the Geneva experiment, see page 66.

Credit is due Mr. C. R. Hudson for making or checking all calculations in this bulletin.