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Co-operative Experiments with Cotton in 1899-1900.

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CO-OPERATIVE FERTILIZER EXPERIMENTS WITH COTTON IN 1899 and 1900.

BY J. F. DUGGAR.

These experiments were conducted under the direction of the Agricultural Department of this Station in 1899 and 1900. These tests in 1899 were made by farmers in nineteen localities; the tests made in 1900 were conducted in eighteen localities, not including in this count the few experimenters who failed to report results.

The method of conducting the experiments was the same as in former years. The plots were each one-eighth acre in area.

The following is the list of those who made experiments in 1899 and 1900 and who reported results.

Name.	Post Office.	County.	Page
Agricultural School	Hamilton	Marion	50
Autrey, A.	Berneys	Talladega	50
Ballard J. L.	Jackson	Clarke	40
Bevill, W. C.	Bevill	Choctaw	38
Borland, T. M.	Dothan	Henry	46
Chappell, C. A.	Dillburg	Pickens	51
Chism, W. T	Vick	Bibb	20
Culver, J. W.	Jackson	Clarke	40
Cunningham, E. L.	Furman	Wilcox	11
Cory, A. F.	Evergreen	Conecuh	52
Daffin, E. J	Tuscaloosa	Tuscaloosa	17
Duncan, J. S.	Maple Grove	Cherokee	13
Experiment Station	Auburn	Lee	24
Foster, J. D.	Auburn	Lee	27
French, J. W.	Gordo	Pickens	15

THE FERTILIZERS USED.

These consisted of high grade acid phosphate guaranteed to contain at least 14 per cent. of available phosphoric acid.

The following table gives the plan of the experiment and the composition of the fertilizers employed:

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 mixture, per ton.
	Lbs.		*Lbs.*	*Lbs.*	*Lbs.*	
1	200	Cotton seed meal.....	13.58	5.76	3.54	
		In 100 lbs. s. c. meal. *	6.79	2.88	1.77	$19.00
2	240	Acid phosphate...	....	36.12	......	
		In 100 lbs. acid phos	....	**15.05**	....	12.50
4	200	Kainit	....	....	24.60	
		In 100 lbs kainit.	....	......	12.30	13.75
5	200 240	Cotton seed meal.... Acid phosphate	13.58	41.88	3.54	
		In 100 lbs. above mixt.	**3.09**	**9.52**	**.80**	15.45
6	200 200	Cotton seed meal.... Kainit	13.58	5.76	28.14	
		In 100 lbs. above mixt	**3.39**	**1.44**	**7.03**	16.38
7	240 200	Acid phosphate .... Kainit	....	.....	......	
		In 100 lbs. above mixt	....	**8.21**	**5.59**	13.09
9	200 240 200	Cotton seed meal ... Acid phosphate ..... Kainit	13.58	41.88	28.14	
		In 100 lbs above mixt	**2.12**	**6.54**	**4.39**	14.94
10	200 240 100	Cotton seed meal.... Acid phosphate ..... Kainit	13.58	41.88	15.84	
		In 100 lbs. above mixt	**2.59**	**7.75**	**2.93**	15.11

* Average of many analyses.
† Counting all the phosphoric acid in cotton seed meal as available.

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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 $\frac{3}{14}$.

The phosphate and cotton seed were purchased at market prices. Most of the kainit was donated by the German Kali Works.

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. Abnormal weather conditions in 1899 and 1900 resulted in an unusually large proportion of inconclusive experiments.

THE WEATHER IN 1899 and 1900.

The following data are taken from the records of the Alabama Section of the Weather Bureau for 1899 and 1900 and give average results of a number of stations:

	1899.	1900.
Rainfall for April, inches	2.80	9.06
Rainfall for May, inches	2.03	2.64
Rainfall for June, inches	2.54	11.80
Rainfall for July, inches	6.76	4.93
Rainfall for August, inches	3.68	2.89
Rainfall for September, inches	.66	4.00
Rainfall for October, inches	2.18	5.64
Rainfall for November, inches	3.04	3.88

It will be seen from the above that the spring and early summer of 1899 were very dry. Complaints of drought in that year were general. In 1900 an excessive precipitation in April and June greatly injured crops, and in addition there was in many localities a severe drought in August.

Two more unfavorable seasons in immediate succession seldom occur.

EXPERIMENTS MADE BY W. F. FULTON, LARIMORE OR COLLINSVILLE, DEKALB COUNTY.

Dark gray, mulatto, or reddish, stiff soil; subsoil red clay.

An experiment with cotton has been conducted on this farm in Big Wills Valley for three years in succession on land cleared about three-quarters of a century ago. The crop preceding the cotton experiments of both 1899 and 1900 was corn. The early part of the summer of 1899 was rather dry; in 1900 "from the time the cotton was planted until it was laid by my notes show almost continuous rain,—the wettest season in the knowledge of the oldest inhabitant."

The results for 1898 were printed in Bulletin No. 102. Those for 1899 and 1900 are given in the following table:

Larimore or Collinsville experiment with cotton.

Plot No.	Fertilizers. Amount per acre.	Fertilizers. Kind.	1899 Yield seed cotton per acre.	1899 Increase over unfertilized plots.	1900 Yield seed cotton per acre.	1900 Increase over unfertilized plots.
	Lbs.		*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
1	200	Cotton seed meal......	648	208	544	0
2	240	Acid phosphate........	760	320	880	336
3	00	No fertilizer..........	440	......	544	....
4	200	Kainit............	648	205	666	107
5	200 240	Cotton seed meal ... Acid phosphate......	880	434	1120	550
6	200 200	Cotton seed meal.... Kainit	736	287	920	337
7	240 200	Acid phosphate...... Kainit.......	856	404	1064	468
8	00	No fertilizer..........	456	....	608	....
9	200 240 200	Cotton seed meal.... Acid phosphate...... Kainit..............	976	520	1208	600
10	200 240 100	Cotton seed meal.... Acid phosphate... .. Kainit	912	456	1032	424

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

	1899	1900
To unfertilized plot	208 lbs.	0 lbs.
To acid phosphate plot	114 lbs.	214 lbs.
To kainit plot	82 lbs.	230 lbs.
To acid phosphate and kainit plot.	116 lbs.	132 lbs.
Average increase with cotton seed meal.......................	**130 lbs.**	**144 lbs.**

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

To unfertilized plot	320 lbs.	336 lbs.
To cotton seed meal plot	126 lbs.	550 lbs.
To kainit plot	233 lbs.	263 lbs.
To cotton seed meal and kainit plot	233 lbs.	263 lbs.
Average increase with acid phosphate	**219 lbs.**	**378 lbs.**

Increase of seed cotton per acre when kainit was added:

To unfertilized plot	205 lbs.	107 lbs.
To cotton seed meal plot	79 lbs.	337 lbs.
To acid phosphate plot	84 lbs.	132 lbs.
To cotton seed meal and acid phosphate plot	86 lbs.	50 lbs.
Average increase with kainit	**116 lbs.**	**157 lbs**

The principal need of this soil, clearly shown in each of three tests, is for phosphate, which has paid a large profit, whether employed alone or in combination with any of the other materials. The increase attributable to phosphate in each of the three years is respectively 464, 219, and 378 pounds of seed cotton per acre. Cotton seed meal usually increased the yield more than enough to cover its cost, the averages for the 3 years being respectively 152, 130, and 144 pounds of seed cotton. Its relatively slight effect suggests the advisability of reducing the amount of cotton seed meal, of which about half as much as of phosphate might be used for cotton.

Kainit was the least beneficial on this soil of the ingredients of the complete fertilizer and the figures indicate that its addition to the mixture of phosphate and kainit was not profitable.

EXPERIMENT MADE BY W. M. PURIFOY, 2 MILES NORTH-EAST OF SNOW HILL, WILCOX COUNTY.

White bald prairie; subsoil, white rotten limestone.

This experiment was made in 1899 on land especially favorable to the development of black rust of cotton. The land was not broken until May 25, when it was bedded with a one-horse plow. "Many stalks had nothing on them on account of coming up too late. Extreme drought ruined the experiment."

The table on page 11 gives the yields and the subjoined analysis of results of Mr. Purifoy's tests, both in 1898 and 1899, shows the increase attributable to each fertilizer, when used alone or in combinations under cotton growing on poor white prairie soil.

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

	1898.	1899.
To unfertilized plot	128 lbs.	144 lbs.
To acid phosphate plot	27 lbs.	16 lbs.
To kainit plot	227 lbs.	144 lbs.
To acid phosphate and kainit plot	141 lbs.	128 lbs.
Average increase with cotton seed meal	**131 lbs.**	**100 lbs.**

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

	1898.	1899.
To unfertilized plot	200 lbs.	208 lbs.
To cotton seed meal plot	99 lbs.	48 lbs.
To kainit plot	209 lbs.	240 lbs.
To cotton seed meal and kainit plot	123 lbs.	224 lbs.
Average increase with acid phosphate	**158 lbs.**	**180 lbs.**

Increase of seed cotton per acre when kainit was added:

To unfertilized plot	27 lbs.	0 lbs.
To cotton seed meal plot..........	72 lbs.	0 lbs.
To acid phosphate plot	18 lbs.	32 lbs.
To cotton seed meal and acid phosphate plot	96 lbs.	176 lbs.
Average increase with kainit......	**41 lbs.**	**52 lbs.**

In the above paragraphs the results of Mr. Purifoy's experiment in 1898 are republished to show the close correspondence between the results of the two years, both tending to indicate that the phosphate was more beneficial than cotton seed meal and that kainit was of least effect.

Snow Hill and Furman experiments with cotton on white bald prairie.

Plot No.	Fertilizers. Amount per acre	Fertilizers. Kind.	Snow Hill 1899. Yield seed cotton per acre.	Snow Hill 1899. Increase over unfertilized plots.	Furman. 1900. Yield seed cotton per acre	Furman. 1900. Increase over unfertilized plots.
	Lbs.		*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
1	200	Cotton seed meal.......	144	144	480	80
2	240	Acid phosphate.......	208	208	480	80
3	00	No fertilizer...........	00	....	400	....
4	200	Kainit................	00	0	376	—27
5	200 240	Cotton seed meal .. Acid phosphate	192	192	664	258
6	200 200	Cotton seed meal... Kainit	144	144	488	79
7	240 200	Acid phosphate...... Kainit.............	240	240	616	204
8	00	No fertilizer	00	....	416	....
9	200 240 200	Cotton seed meal.. Acid phosphate...... Kainit..............	368	368	624	208
10	200 240 100	Cotton seed meal.... Acid phosphate...... Kainit.............	416	416	616	200

EXPERIMENT MADE IN 1900 BY E. L. CUNNINGHAM, 6 MILES EAST OF FURMAN, WILCOX COUNTY.

White prairie, the surface dark gray; sub-soil white rotten limestone.

The original growth, cleared about 30 or 40 years ago, is reported as oak and hickory with some short-leaf pine. The field was in cotton in 1897 and 1898 and uncultivated in 1899.

The depth of plowing was 5 or 6 inches. On Plot 5 there was considerable black rust, but very little on Plots 9 and 10, where a complete fertilizer containing kainit was used. The stand was full and uniform. There was too much rain.

The yields are given in the table above.

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

To unfertilized plot	80 lbs.
To acid phosphate plot	178 lbs.
To kainit plot..............................	106 lbs.
To acid phosphate and kainit plot............	4 lbs.
Average increase with cotton seed meal, - -	**92 lbs.**

Increase of seed cotton per acre when acid phosphate was used.

To unfertilized plot	80 lbs.
To cotton seed meal plot	178 lbs.
To kainit plot	231 lbs.
To cotton seed meal and kainit plot..........	129 lbs.
Average increase with acid phosphate, - -	**130 lbs.**

Increase of seed cotton per acre when kainit was added:

To unfertilized plot	—27 lbs.
To cotton seed meal plot	—1 lbs.
To acid phosphate plot	124 lbs.
To seed cotton meal and acid phosphate plot	—50 lbs.
Average increase with kainit,	**12 lbs.**

Mr. Cunningham's experiment, like both of the tests made by Mr. Purifoy, on the same class of land, white prairie, indicates that phosphate was most needed. The largest yield was made with a mixture of cotton seed meal and phosphate. Kainit did not increase the yield, though it did seem to somewhat restrain the rust on Plots 9 and 10.

It should be noted that white prairie soil was not very responsive to commercial fertilizers and that none of these paid a very large profit.

Although phosphate was undoubtedly useful in each of these experiments, its effects were far less notable than the favorable influence that is exerted by adding suitable vegetable matter to this class of soils. We cannot yet recommend the use of phosphate on these soils, believing that the same money invested in the seed of melilotus or of other renovating plant would be more profitably spent.

EXPERIMENTS MADE BY J. S. DUNCAN ON G. W. FREEMAN'S FARM, 1½ MILES SOUTHWEST OF MAPLE GROVE, CHEROKEE COUNTY.

In 1899 the test was made on gray sandy upland, with red subsoil; in 1900 on light alluvial second bottom of a dark gray color, with red subsoil. Both fields had been cleared for more than a quarter of a century. The cotton experiment of 1899 was preceded by cotton, that of 1900 by corn.

In 1899 the summer was excessively dry, in 1900 excessively wet.

Maple Grove experiment with cotton.

Plot No.	Fertilizers. Amount per acre.	Fertilizers. Kind.	Maple Grove. 1899 Yield seed cotton per acre.	Maple Grove. 1899 Increase over unfertilized plots	Maple Grove. 1900 Yield seed cotton per acre.	Maple Grove. 1900 Increase over unfertilized plots
	Lbs.		*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
1	200	Cotton seed meal	800	176	1036	220
2	240	Acid phosphate	752	128	932	116
3	00	No fertilizer	624	....	816	....
4	200	Kainit	616	—43	920	106
5	200 240	Cotton seed meal Acid phosphate	960	266	992	181
6	200 200	Cotton seed meal Kainit	904	175	1032	223
7	240 200	Acid phosphate Kainit	776	12	1024	218
8	00	No fertilizer	800	....	804	....
9	200 240 200	Cotton seed meal Acid phosphate Kainit	1024	224	1080	276
10	200 240 100	Cotton seed meal Acid phosphate Kainit	992	192	1032	228

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

	1899.	1900.
To unfertilized plot	176 lbs.	220 lbs.
To acid phosphate plot	138 lbs.	65 lbs.
To kainit plot	218 lbs.	117 lbs.
To acid phosphate and kainit plot	212 lbs.	58 lbs.
Average increase with cotton seed meal	**186 lbs.**	**115 lbs.**

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

To unfertilized plot	128 lbs.	116 lbs.
To cotton seed meal plot	90 lbs.	—39 lbs.
To kainit plot....................	55 lbs.	112 lbs.
To cotton seed meal and kainit plot.	49 lbs.	53 lbs.
Average increase with acid phosphate........................	**81 lbs.**	**61 lbs.**

Increase of seed cotton per acre when kainit was added:

To unfertilized plot	—43 lbs.	106 lbs.
To cotton seed meal plot	—1 lb.	3 lbs.
To acid phosphate plot..........	—116 lbs.	102 lbs.
To cotton seed meal and acid phosphate plot	—42 lbs.	95 lbs.
Average increase (or decrease[—]) with kainit.............. ..	**—51**	**77 lbs.**

In both years cotton seed meal was the most important fertilizer for cotton; phosphate afforded a small increase, possibly because of abnormal weather conditions; kainit was useless on upland in 1899 and scarcely profitable in 1900 on second bottom land.

EXPERIMENT MADE BY J. W. FRENCH, 3 MILES NORTH OF GORDO, PICKENS COUNTY.

This test was conducted in 1899 on gray upland, and in 1900 on dark sandy upland, both having red subsoils, rather retentive of water. The cotton experiment of 1899 was preceded by corn, that of 1900 by cotton. In both cases the tests were on old fields, cleared of pines and reclaimed four to seven years before the experiments began.

The former season was exceedingly dry; the latter, "the most unfavorable ever known, first too wet and then too dry." The stand was reported as excellent.

Gordo experiment with cotton.

Plot No.	Fertilizers. Amount per acre.	Fertilizers. Kind.	1899. Yield seed cotton per acre.	1899. Increase over unfertilized plots.	1900. Yield seed cotton per acre.	1900. Increase over unfertilized plots.
	Lbs.		*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
1	200	Cotton seed meal	536	200	696	312
2	240	Acid phosphate	848	512	568	184
3	00	No fertilizer	336	....	384	....
4	200	Kainit	360	38	400	11
5	200 240	Cotton seed meal Acid phosphate	944	637	728	335
6	200 200	Cotton seed meal Kainit	528	235	584	186
7	240 200	Acid phosphate Kainit	736	458	552	149
8	00	No fertilizer	264	....	408	....
9	200 240 200	Cotton seed meal Acid phosphate Kainit	1032	868	888	480
10	200 240 100	Cotton seed meal Acid phosphate Kainit	928	664	818	440

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

	1899..	1900.
To unfertilized plot	200 lbs.	312 lbs.
To acid phosphate plot	125 lbs.	151 lbs.
To kainit plot	197 lbs.	175 lbs.
To acid phosphate and kainit plot	410 lbs.	331 lbs.
Average increase with cotton seed meal,	**238 lbs.**	**242 lbs.**

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

To unfertilized plot	512 lbs.	184 lbs.
To cotton seed meal plot	437 lbs.	23 lbs.
To kainit plot	420 lbs.	138 lbs.
To cotton seed meal and kainit plot	633 lbs.	294 lbs.
Average increase with acid phosphate,	**501 lbs.**	**160 lbs.**

Increase of seed cotton per acre when kainit was added:

To unfertilized plot	38 lbs.	11 lbs.
To cotton seed meal plot	—35 lbs.	—126 lbs.
To acid phosphate plot	—54 lbs.	—35 lbs.
To cotton seed meal and acid phosphate plot	231 lbs.	145 lbs.
Average increase with kainit,	**63 lbs.**	**—1 lb.**

Phosphate was the material of most importance for the gray soil and it was also needed on the darker soil. Cotton seed meal was first in importance in 1900 and second in 1899. Kainit was useless except in a complete fertilizer, in which combination it was slightly profitable, but never so important as phosphate or cotton seed meal.

EXPERIMENT CONDUCTED BY E. J. DAFFIN, 3 MILES S. OF TUSCALOOSA, TUSCALOOSA COUNTY.

This test was made in 1900 on the F. S. Moody farm. The soil is described as second bottom, sandy, and of a reddish gray color; the subsoil, as red clay. The original growth, removed more than half a century ago, is sweet gum, black gum, persimmon, and sassafras. The preceding crop was cotton.

June and July brought an excessive rainfall, interfering with cultivation and August was very dry. There were 1,065 plants per eighth-acre plot. "Red rust" was reported as injurious alike on all plots.

Both cotton seed meal and acid phosphate, whether used alone, or in any combination, greatly increased the yield and afforded a good profit. Kainit was practically ineffective except in combination with the other two fertilizers, where it seems to have increased the yield to a profitable extent; the complete fertilizer, containing kainit (Plot 9) affording an increase greater by 236 pounds of seed cotton per acre than the increment where only phosphate and meal were used together. (Plot 5.)

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

To unfertilized plot . . . . .216 lbs.
To acid phosphate plot . . . . .356 lbs.
To kainit plot . . . . .259 lbs.
To acid phosphate and kainit plot . . . . .529 lbs

Average increase with cotton seed meal . . . . 340 lbs.

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

To unfertilized plot . . . . .152 lbs.
To cotton seed meal plot . . . . .292 lbs.
To kainit plot . . . . .189 lbs.
To cotton seed meal and kainit plot . . . . .459 lbs.

Average increase with acid phosphate . . . . 273 lbs.

Increase of seed cotton per acre when kainit was added:

To unfertilized plot . . . . 26 lbs.
To cotton seed meal plot . . . . 69 lbs
To acid phosphate plot . . . . 63 lbs
To cotton seed meal and acid phosphate . . . . . .236 lbs.

Average increase with kainit . . . . 99 lbs.

Mr. Daffin also conducted similar tests in 1897 and 1898 on red sandy upland, with red clay subsoil, two and one-half miles east of Tuscaloosa. In both years phosphate was by far the chief need of that soil, but both cotton seed meal and kainit afforded considerable increase, so that the greatest profit was obtained by the use of a complete fertilizer containing all three of these materials.

Experiment made in 1899 by E. Melton, one mile west of Hugent, Fayette County.

Dark or "mulatto" soil, with red clay subsoil.

The original growth, removed about 50 years ago, is reported as short-leaf pine, oak, and hickory. The three preceding crops were corn. The plants were free from rust.

As shown in the detailed statement below, phosphate was the fertilizer chiefly needed by this soil, and its use, alone and in every combination, was highly profitable, the average increase attributable to phosphate being 364 pounds of seed cotton per acre. Cotton seed meal was next in importance, affording an average increase of 168 pounds per acre.

The most profitable fertilizer was a mixture of acid phosphate and cotton seed meal. Kainit was not needed.

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

To unfertilized plot	128 lbs.
To acid phosphate plot	160 lbs.
To kainit plot	176 lbs.
To acid phosphate and kainit plot	208 lbs.
Average increase with cotton seed meal	**168 lbs.**

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

To unfertilized plot	400 lbs.
To cotton seed meal plot	432 lbs.
To kainit plot	296 lbs.
To cotton seed meal and kainit plot	328 lbs.
Average increase with acid phosphate	**364 lbs.**

Increase of seed cotton per acre when kainit was added:

To unfertilized plot	72 lbs.
To cotton seed meal plot	120 lbs.
To acid phosphate plot	—32 lbs.
To cotton seed meal and acid phosphate plot	16 lbs.
Average increase with kainit	**44 lbs.**

EXPERIMENTS CONDUCTED BY W. T. CHISM, 1 MILE SOUTH-EAST OF VICK, BIBB COUNTY.

Both experiments were conducted on dark gray sandy or loamy branch bottom soil, rather retentive of moisture. The earlier experiment was preceded by corn, the later one by cotton.

The field had been cleared about 75 years and the original growth is reported as sweet gum, red and white oak, hickory, ash, poplar, cucumber tree, and a few short-leaf pines, and chestnuts.

The latter part of the season of 1899 was dry and unfavorable and in 1900 there was almost continuous wet weather during the season of cultivation. The soil was worked June 25, 1900, when too wet, by which the experimenter reports that the crop was greatly damaged.

Increase of seed cotton per acre when cotton seed meal was used.

	1899.	1900.
To unfertilized plot	256 lbs.	62 lbs.
To acid phosphate plot	96 lbs.	77 lbs.
To kainit plot	244 lbs.	100 lbs.
To acid phosphate and kainit plot	92 lbs.	15 lbs.
Average increase with cotton seed meal.	**172 lbs.**	**64 lbs.**

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

To unfertilized plot	104 lbs.	24 lbs.
To cotton seed meal plot	—56 lbs.	39 lbs.
To kainit plot	116 lbs.	78 lbs.
To cotton seed meal and kainit plot	—24 lbs.	—7 lbs.
Average increase with acid phosphate,	**35 lbs.**	**34 lbs.**

Increase of seed cotton per acre when kainit was added:

To unfertilized plot	—24 lbs.	—1 lb.
To cotton seed meal plot	—32 lbs.	37 lbs.
To acid phosphate plot	—12 lbs.	53 lbs.
To cotton seed meal and acid phosphate plot	—16 lbs.	—9 lbs.
Average increase with kainit	**—20 lbs.**	**20 lbs.**

In 1900 cotton seed meal was the only fertilizer that was very effective. In 1899 none of them were decidedly beneficial. On account of the extremely unfavorable weather in both years, it is probable that neither experiment indicates the real needs of this soil, so that we must place these tests in the class of inconclusive experiments.

EXPERIMENT MADE IN 1899 BY J. P. SLATON, 7 MILES SOUTH OF NOTASULGA AND 7 MILES N. E. OF TUSKEGEE, MACON COUNTY.

Gray sandy upland, with retentive red clay subsoil.

The field was originally cleared about 75 years ago, and cleared of the second growth about 12 years ago. The original growth was long leaf pine and oak. The preceding crop was cotton.

The cotton did not come up until the first of June and this late start may have kept the fertilizers from exerting their full effect. The stand was good.

As shown in the table on page 23 and in the detailed statements below, phosphate and cotton seed meal were both effective in nearly every combination. Kainit was not needed.

Mr. Slaton conducted an experiment in 1898 (see Bulletin No. 102) on similar soil. In that year acid phosphate and cotton seed meal were even more profitable than in 1900 and kainit was useless. It seems that this gray soil, with a clay subsoil near at hand, needs only a mixture of acid phosphate and cotton seed meal to produce a profitable cotton crop.

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

To unfertilized plot	192 lbs.
To acid phosphate plot	43 lbs.
To kainit plot	110 lbs.
To acid phosphate and kainit plot	123 lbs.
Average increase with cotton seed meal	**117 lbs.**

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

To unfertilized plot	176 lbs.
To cotton seed meal plot	27 lbs.
To kainit plot	145 lbs.
To cotton seed meal and kainit plot	158 lbs.
Average increase with acid phosphate	**127 lbs.**

Increase of seed cotton per acre when kainit was added:

To unfertilized plot	20 lbs.
To cotton seed meal plot	—62 lbs.
To acid phosphate plot	—11 lbs.
To cotton seed meal and acid phosphate plot	69 lbs.
Average increase with kainit	**4 lbs.**

Tuscaloosa, Hugent, Vick and Notasulga experiments with cotton.

Plot No.	Fertilizers. Amount per acre.	Fertilizers. Kind.	Tuscaloosa. 1900. Yield seed cotton per acre.	Tuscaloosa. 1900. Increase over unfertilized plots	Hugent. 1899. Yield seed cotton per acre.	Hugent. 1899. Increase over unfertilized plots.	Vick. 1899. Yield seed cotton per acre.	Vick. 1899. Increase over unfertilized plots.	Vick 1900. Yield seed cotton per acre.	Vick 1900. Increase over unfertilized plots.	Notasulga. 1899. Yield seed cotton per acre.	Notasulga. 1899. Increase over unfertilized plots.
	Lbs.		*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
1	200	Cotton seed meal	680	216	464	128	992	256	526	62	592	192
2	240	Acid phosphate	616	152	736	400	840	104	488	24	576	176
3	00	No fertilizer	464	......	336	.....	736	.....	464	....	400	....
4	200	Kainit	496	26	400	72	668	—24	452	—1	544	20
5	260 240	Cotton seed meal Acid phosphate	984	508	880	560	848	200	544	101	724	219
6	200 200	Cotton seed meal Kainit	738	285	560	248	824	220	532	99	616	130
7	240 200	Acid phosphate Kainit	701	2 5	672	368	652	92	500	77	632	165
8	00	No fertilizer	496	....	296	.....	516	.....	412	....	448	......
9	200 240 200	Cotton seed meal Acid phosphate Kainit	1240	744	872	576	700	184	504	92	736	288
10	200 240 100	Cotton seed meal Acid phosphate Kainit	1040	544	752	456	840	324	496	84	744	296

Auburn Experiments in 1898, 1899, & 1900, on Experiment Station Farm.

These tests were made on three adjacent areas set apart for permanent fertilizer experiments with cotton, corn, and oats. The soil is of the same character on all three areas, as was also the previous fertilization of each plot.

All three of the cotton crops were preceded by oats fertilized like the corresponding cotton plot.

In 1900 each plot received the same fertilizer as in 1898 and 1899. Hence the results should show not only the immediate effects of fertilizers, but the residual on cumulative effects, if there are any on this light soil.

Contrary to our usual custom, cowpeas were not sown after the oats, but instead a thin growth of crabgrass, rag weed, and poverty weed covered the ground during the summer and fall following the harvesting of each oat crop.

Commercial fertilizers, chiefly acid phosphate, had been liberally, though not lavishly, employed annually for a number of years before the experiment began.

The soil is a deep sand bed nearly free from stone or gravel, and the plots occupy the crest of a hill.

The dates of planting were April 15, 1898; April 11, 1899; and April 24, 1900. The stand was nearly perfect except in 1900, when there was some slight want of uniformity, so that the figures for 1900 represent the yields after being corrected on the basis of an equal number of plants on each plot.

The Peerless variety was used each year. In 1898 black rust was quite injurious. September 23 it was estimated that the plants on the plots on which kainit had been used had shed 50 to 70 per cent. of their leaves while the plants receiving no kainit had shed 75 to 92 per cent of their leaves.

The prevalence of black rust probably accounts, at least in part, for the very favorable showing made by kainit in 1898, for numerous experiments recorded in the bulletins of this Station show that kainit generally decreases the injury from black rust.

Fertilizer experiments with cotton at Auburn, 1898, 1899 and 1900 on Experiment Station farm.

Plot No.	Fertilizers. Amount per acre.	Fertilizers. Kind.	1898. Yield.	1898. Increase.	1899. Yield.	1899. Increase.	1900. Yield.	1900. Increase.	Average increase 3 years.
	Lbs.		*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
1	200	Cotton seed meal......	889	214	1003	234	379	35	161
2	240	Acid phosphate........	853	178	819	145	266	—78	82
3	00	No fertilizer..........	675	....	774	...	344	...	......
4	200	Kainit....	783	122	1049	262	360	46	143
5	200 240	Cotton seed meal.... Acid phosphate	1013	346	1029	231	393	109	229
6	200 200	Cotton seed meal.... Kainit......	1192	529	1075	265	434	180	325
7	240 200	Acid phosphate...... Kainit	1145	486	1051	229	246	22	246
8	00	No fertilizer..........	655	....	833	....	194	....	......
9	200 240 200	Cotton seed meal.... Acid phosphate...... Kainit	1177	522	1152	319	435	241	361
10	200 240 100	Cotton seed meal.... Acid phosphate...... Kainit	....	....	1055	422	...	....	......

Increase in yield from cotton seed, acid phosphate, and kainit on Experiment Station Farm in 1898, 1899 and 1900.

	Increase; lbs. seed cotton per acre.			
	1898	1899	1900.	Average, 3 years.
Increase of seed cotton per acre where cotton seed meal was added	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
To unfertilized plot	214	234	35	161
To acid phosphate plot	168	86	187	147
To kainit plot	407	3	134	181
To acid phosphate and kainit plot	36	90	219	115
Average increase with **cotton seed meal.**	206	103	144	**151**
Increase of seed cotton per acre where phosphate was added				
To unfertilized plot	178	145	—78	82
To cotton seed meal plot	132	—3	194	80
To kainit plot	364	—33	—24	102
To cotton seed meal and kainit plot	—7	54	61	36
Average increase with **acid phosphate**	167	41	38	**82**
Increase of seed cotton per acre where kainit was added				
To unfertilized plot	122	262	46	143
To cotton seed meal plot	315	31	145	164
To acid phosphate plot	308	84	100	164
To cotton seed meal and acid phos. plot	176	88	132	132
Average increase with **kainit**	235	116	106	**152**

In 1898 the greatest increase in yield was obtained by the use of a mixture of cotton seed meal and kainit. This mixture was a close second to the complete fertilizer in 1899 and 1900 and its average increase for the three years lacked only 36 pounds of seed cotton per acre of equalling the increase due to a complete fertilizer.

Quite unexpectedly, acid phosphate has not been very effective. If this is due to the accumulation of a sufficient supply of phosphoric acid in the soil from the phosphate applied annually for many years before the beginning of the experiment, the value of applications of phosphate should become more marked in future as this supply is exhausted.

It would be safe to estimate the amount of phosphate applied annually during the decade before the test began at 200 pounds per acre or less. Results on most soils seem to indicate that phosphate is the most important single fertilizing material for cotton.

EXPERIMENTS CONDUCTED BY J. D. FOSTER, 1 MILE SOUTH OF AUBURN, LEE COUNTY.

Light sandy loam, gray upland; subsoil yellowish clay or loam, not compact.

The experiments of 1899 and 1900 were conducted in different parts of the same field, on identical soil.

The field, on which the original growth was reported as long-leaf pine, had been in cultivation for a great many years.

The crop preceding the experiment of 1899 was corn, with drilled cowpeas between the rows. The peas made only a moderate growth and were grazed in the fall of 1898.

The stand of cotton was uniform. In 1900 cotton was planted May 25. The cotton experiment in 1900 occupied the plots that had been used in 1899 for a similar fertilizer experiment with corn, (having no cowpeas between the rows.) Hence the results of the cotton experiment of 1900 should show not only the immediate effects of each fertilizer, but also the residual or second-year effects, if there were any lasting benefit from commercial fertilizers used on this light soil.

Auburn experiment with cotton on J. D. Foster farm.

Plot No.	Fertilizers. Amount per acre.	Fertilizers. Kind.	1899. Yield seed cotton per acre.	1899. Increase over unfertilized plots.	1900. Yield seed cotton per acre.	1900. Increase over unfertilized plots.
	Lbs.		*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
1	200	Cotton seed meal	616	280	600	240
2	240	Acid phosphate	528	192	488	128
3	00	No fertilizer	336	....	360	....
4	200	Kainit	520	183	432	79
5	200 240	Cotton seed meal .... Acid phosphate	744	405	744	397
6	200 200	Cotton seed meal .... Kainit	648	307	688	347
7	240 200	Acid phosphate ...... Kainit	568	225	528	194
8	00	No fertilizer	344	....	328	....
9	200 240 200	Cotton seed meal .... Acid phosphate ..... Kainit	664	320	726	398
10	200 240 100	Cotton seed meal .... Acid phosphate ...... Kainit	656	312	688	360

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

	1899.	1900.
To unfertilized plot	280 lbs.	240 lbs.
To acid phosphate plot	213 lbs.	269 lbs.
To kainit plot	124 lbs.	268 lbs.
To acid phosphate and kainit plot....	95 lbs.	204 lbs.
Average increase with cotton seed meal,	**178 lbs.**	**245 lbs.**

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

	1899.	1900.
To unfertilized plot	192 lbs.	128 lbs.
To cotton seed meal plot	125 lbs.	157 lbs.
To kainit plot	42 lbs.	115 lbs.
To cotton seed meal and kainit plot ..	13 lbs.	51 lbs.
Average increase with acid phosphate,	**93 lbs.**	**113 lbs.**

Increase of seed cotton per acre when kainit was added:

To unfertilized plot	183 lbs.	79 lbs.
To cotton seed meal plot	27 lbs.	107 lbs.
To acid phosphate plot	33 lbs.	66 lbs.
To cotton seed meal and acid phosphate plot	—85 lbs.	1 lb.
Average increase with kainit	**39 lbs.**	**63 lbs.**

The figures for the two years agree closely and show that a larger increase was afforded by cotton seed meal than by any other single material. The most profitable of all the fertilizers was a mixture of cotton seed meal and phosphate. Kainit was unprofitable.

Experiment Conducted by Judge T. J. Thomason, 2 miles south of Ranburne (near Kaylor), Randolph County.

This experiment was made in 1899 on gray land, with yellow subsoil. The soil is described as table land rather retentive of moisture. The preceding crop was cotton.

This is the third experiment on a uniform plan conducted by Judge Thomason. (See Bulletin No. 107; p. 274). If we take the average increase of each fertilizer under all conditions we have for the entire period of three years an average increase of 187 pounds of seed cotton per acre attributable to cotton seed meal, 197 to phosphate, and only 31 to kainit. The inference is plain that a mixture of cotton seed meal and phosphate was all that cotton needed on this soil, and that the addition of kainit, at the rate of 200 pounds per acre, was usually unprofitable. The results for 1899, when kainit afforded a slight profit, were more favorable to potash than were the results of the two previous tests on this soil.

The following statements show the average increase in yield for the entire period of three years.

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

To unfertilized plot	217 lbs.
To acid phosphate plot	137 lbs.
To kainit plot	156 lbs.
To acid phosphate and kainit plot	238 lbs.
Average increase with cotton seed meal	**187 lbs.**

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

To unfertilized plot	264 lbs.
To cotton seed meal plot	184 lbs.
To kainit plot	128 lbs.
To cotton seed meal and kainit plot	210 lbs.
Average increase with acid phosphate	**197 lbs.**

Increase of seed cotton per acre when kainit was added:

To unfertilized plot	90 lbs.
To cotton seed meal plot	29 lbs.
To acid phosphate plot	—80 lbs.
To acid phosphate and cotton seed meal	54 lbs.
Average increase with kainit	**31 lbs.**

EXPERIMENT CONDUCTED BY T. T. MEADOWS ½ MILE NORTH OF CUSSETA, CHAMBERS COUNTY.

Soil, red, stoney; subsoil red clay.

This test, made in 1899, is the third experiment conducted on similar soil by Mr. Meadows. (See Bulletin No. 107, p. 274.)

Giving attention to the average results for the three years we find that the principal need of this soil was for acid phosphate, which gave an average increase of 202 pounds of seed cotton per acre. Cotton seed meal was added to the phosphate with profit, but kainit was not needed.

The red clay soils of the Metamorphic Region in this part of the State seem to contain sufficient potash for the ordinary needs of the cotton crop, though when black rust is prevalent kainit is beneficial even here.

Statements of the average increase in yield for the *three years* follows:

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

To unfertilized plot	109 lbs.
To acid phosphate plot	156 lbs.
To kainit plot	164 lbs.
To acid phosphate and kainit plot	128 lbs.
Average Increase with cotton seed meal	**139 lbs.**

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

To unfertilized plot	192 lbs.
To cotton seed meal plot	239 lbs.
To kainit plot	217 lbs.
To cotton seed meal and kainit plot	189 lbs.
Average increase with acid phosphate	**202 lbs.**

Increase of seed cotton per acre when kainit was added:

To unfertilized plot	—8 lbs.
To cotton seed meal plot	43 lbs.
To acid phosphate plot	15 lbs.
To cotton seed meal and acid phosphate plot	—9 lbs.
Average increase with kainit	**10 lbs.**

EXPERIMENT CONDUCTED IN 1900 BY W. N. INGRAM, 8 MILES EAST OF OPELIKA, LEE COUNTY.

The description of the land seems to indicate that the soil was a yellowish loam, with subsoil of somewhat the same character, and not compact. The original growth is reported as oak and hickory, which had been removed about forty years before. The rainfall was excessive in June. The preceding crop was corn.

The results are not entirely conclusive, but on the whole they show that cotton seed meal was profitable and that the returns from the other fertilizers this wet year were not satisfactory.

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

added:

To unfertilized plot	248 lbs.
To acid phosphate plot	—30 lbs.
To kainit plot	242 lbs.
To acid phosphate and kainit plot	180 lbs.
Average increase with cotton seed meal	**160 lbs.**

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

To unfertilized plot	96 lbs.
To cotton seed meal plot	—182 lbs.
To kainit plot	87 lbs.
To cotton seed meal and kainit plot	25 lbs.
Average increase with acid phosphate	**7 lbs.**

Increase of seed cotton per acre when kainit was added:

To unfertilized plot	29 lbs.
To cotton seed meal plot	23 lbs.
To acid phosphate plot	20 lbs.
To cotton seed meal and acid phosphate plot	230 lbs.
Average increase with kainit	**75 lbs.**

Kaylor, Cusseta and Opelika experiments with cotton.

Plot No.	Fertilizers. Amount per acre.	Fertilizers. Kind.	Kaylor. 1899. Yield seed cotton per acre.	Kaylor. 1899. Increase over unfertilized plots.	Cusseta. 1899 Yield seed cotton per acre.	Cusseta. 1899 Increase over unfertilized plots.	Opelika. 1900. Yield seed cotton per acre.	Opelika. 1900. Increase over unfertilized plots.
	Lbs.		*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
1	200	Cotton seed meal...	888	112	296	104	1000	248
2	240	Acid phosphate.....	848	72	456	264	848	96
3	00	No fertilizer.......	776	......	192	..	752	......
4	200	Kainit....	804	49	152	--45	800	29
5	200 240	Cotton seed meal. Acid phosphate...	1084	350	504	302	856	66
6	200 200	Cotton seed meal. Kainit............	944	232	304	97	1080	271
7	240 200	Acid phosphate ... Kainit............	872	182	472	260	944	116
8	00	No fertilizer........	668	......	216	......	848	......
9	200 240 200	Cotton seed meal. Acid phosphate... Kainit......	1124	456	640	424	1144	296
10	200 240 100	Cotton seed meal. Acid phosphate... Kainit............	1140	472	560	344	1112	264

Experiment Conducted by J. C. Watkins 1½ miles north of Burnt Corn, Monroe County.

The experiments of 1899 and 1900 were made on poor yellowish or chocolate-colored upland sandy soil, with red subsoil. This soil bakes badly.

The rainfall in 1900 was excessive. There was no black rust in either year.

The table on page 34 gives the yields for 1899 and 1900. This is the fourth experiment made by Mr. Watkins according to the present plan. (See Bulletin No. 197, p. 274). Most of the tests have shown that phosphate was more important than cotton seed meal and that kainit only increased the yield; however in 1900 kainit was the most effective fertilizer.

The average results for 4 years show that phosphate gave an average increase of 207, cotton seed meal of 151, and kainit of 70 pounds of seed cotton per acre.

Burnt Corn experiments with cotton.

Plot No.	Fertilizers. Amount per acre.	Fertilizers. Kind.	1899. Yield seed cotton per acre.	1899. Increase over unfertilized plots.	1900. Yield seed cotton per acre.	1900. Increase over unfertilized plots.
	Lbs.		*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
1	200	Cotton seed meal......	480	216	348	—60
2	240	Acid phosphate	556	292	456	48
3	00	No fertilizer..........	264	....	408	....
4	200	Kainit....	280	27	528	128
5	200 240	Cotton seed meal.... Acid phosphate	768	526	492	100
6	200 200	Cotton seed meal.... Kainit	524	293	588	204
7	240 200	Acid phosphate...... Kainit....	684	465	476	100
8	00	No fertilizer..........	208	....	368	....
9	200 240 200	Cotton seed meal. .. Acid phosphate...... Kainit.....	828	620	648	280
10	200 240 100	Cotton seed meal.... Acid phosphate ..... Kainit	944	736	532	164

The following figures refer only to the results obtained in 1900, similar statement for other years having been previously published:

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

To unfertilized plot	—60 lbs.
To acid phosphate plot	52 lbs.
To kainit plot	76 lbs.
To acid phosphate and kainit plot	180 lbs.
Average increase with cotton seed meal.........	**62 lbs.**

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

To unfertilized plot	48 lbs.
To cotton seed meal plot	160 lbs.
To kainit plot	—28 lbs.
To cotton seed meal and kainit plot	76 lbs.
Average increase with acid phosphate	**64 lbs.**

Increase of seed cotton per acre when kainit was added:

To unfertilized plot	128 lbs.
To cotton seed meal plot	264 lbs.
To acid phosphate plot	52 lbs.
To cotton seed meal and acid phosphate plot	180 lbs.
Average increase with kainit	**155 lbs.**

EXPERIMENT MADE BY C. E. RIVERS, 6½ MILES S. OF HURTSBORO, RUSSELL COUNTY.

Dark sandy soil, with yellow subsoil.

This test was made in 1900 on flat land that might be designated as second bottom.

The land had been cleared about 40 years ago of its original growth of long leaf pine, but for many years before the experiment began it had been uncultivated and had grown up in broomsedge. The date of planting was late and it was noted that many bolls, especially on Plots 9 and 10, did not mature.

Phosphate under all conditions was highly profitable. The average increase with cotton meal was not quite sufficient to yield a profit; this poor showing of cotton seed meal is probably due to the fact that considerable vegetable matter and nitrogen must have accumulated on the land while it was uncultivated. On fields in constant cultivation some cotton seed meal would doubtless have been profitable. Kainit was slightly helpful and as a part of a complete fertilizer, containing all three materials, kainit paid a fair profit.

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

To unfertilized plot	154 lbs.
To acid phosphate plot	30 lbs.
To kainit plot	14 lbs.
To acid phosphate and kainit plot	27 lbs.
Average increase with cotton seed meal	**56 lbs.**

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

To unfertilized plot	240 lbs.
To cotton seed meal plot	116 lbs.
To kainit plot	274 lbs.
To cotton seed meal and kainit plot	287 lbs.
Average increase with acid phosphate	**229 lbs.**

Increase of seed cotton per acre when kainit was added:

To unfertilized plot	83 lbs.
To cotton seed meal plot	—57 lbs.
To acid phosphate plot	117 lbs.
To cotton seed meal and acid phosphate plot	114 lbs.
Average increase with kainit	**64 lbs.**

Experiment made in 1899 by A. M. Troyer, ¾ of a mile N. of Calhoun, Lowndes County.

The soil is described as a loam fairly retentive of water and as being of a very light reddish color, with bright red subsoil. The second growth of trees, removed about 5 years ago, was short leaf and old field pine. In 1896 and 1897 this field was not cultivated, and in 1898 the crop was oats.

Under all conditions acid phosphate was highly profitable, the average increase attributable to phosphate being 434 pounds per acre. Cotton seed meal was generally profitable, but not to the same extent as phosphate. Kainit was not needed. By far the larger profit was obtained on the plot containing both acid phosphate and cotton seed meal.

Mr. Troyer also conducted an experiment in 1900 on similar soil, the results of which were entirely inconclusive. They may be found in the table on page 52.

In 1900 he also tested the most promising combinations of fertilizers on an adjoining farm, on very sandy soil.

The fertilizer for this last test was not furnished by the Experiment Station and a detailed report of the amounts of fertilizer used is not at hand.

The following is Mr. Troyer's statement of the increase in yield in 1900 on his sandy soil, where the unfertilized land yielded 384 pounds of seed cotton per acre:

	Increase per acre in lbs. seed cotton.	Net profit.
Cotton seed meal	144	$2.40
Acid phosphate	48	.16
Kainit	112	2.88
Cotton seed meal and phosphate	176	1.76
Cotton seed meal, phosphate and kainit	320	5.28

Apparently on this sandier soil a complete fertilizer was needed, kainit, as well as other materials, yielding a profit.

The increased yields obtained in the experiment at Calhoun in 1899 are given below:

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

To unfertilized plot	312 lbs.
To acid phosphate plot	267 lbs.
To kainit plot	187 lbs.
To acid phosphate and kainit plot	—138 lbs.
Average increase with cotton seed meal	**157 lbs.**

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

To unfertilized plot	482 lbs.
To cotton seed meal plot	437 lbs.
To kainit plot	571 lbs.
To cotton seed meal and kainit plot	246 lbs.
Average increase with acid phosphate	**434 lbs.**

Increase of seed cotton per acre when kainit was added:

To unfertilized plot	107 lbs.
To cotton seed meal plot	—18 lbs.
To acid phosphate plot	196 lbs.
To cotton seed meal and acid phosphate plot . .	—209 lbs.
Average increase with kainit	**19 lbs.**

Experiment made by W. C. Bevill in 1899 near Naheola, Choctaw County.

This experiment was made on upland soil of a "dark mulatto" color, with red clay subsoil. The three preceding crops were cotton. The field had been cleared about 50 years and the original growth is reported as long leaf pine, short leaf pine, oak, and gum.

There was no rust or other injury except from severe drought, which reduced the yield to about half a crop, and which probably makes the experiment nearly valueless as an indication of the needs of the cotton plant on this soil in normal seasons.

Under the conditions of this test no fertilizer was very effective, though the increase with cotton seed meal was sufficient to pay a small profit.

Mr. Bevill conducted an experiment in 1898 on what appeared to be similar soil. In that year cotton seed meal gave a large increase in yield, phosphate a smaller though profitable increment, and kainit an increase barely sufficient to afford a small profit. In 1898 as wel l as in 1899 unfavorable weather vitiated the experiment, and it is doubtful whether the results for either year show the full effect that any of the three fertilizers would exert in normal seasons.

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

To unfertilized plot	56 lbs.
To acid phosphate plot	178 lbs.
To kainit plot	114 lbs.
To acid phosphate and kainit plot	172 lbs.
Average increase with cotton seed meal	**130 lbs.**

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

To unfertilized plot	32 lbs.
To cotton seed meal plot	154 lbs.
T o kainit plot	—25 lbs.
To cotton seed meal and kainit plot	33 lbs.
Average increase with acid phosphate	**49 lbs.**

Increase of seed cotton per acre when kainit was added:

To unfertilized plot	13 lbs.
To cotton seed meal plot	71 lbs.
To acid phosphate plot	—44 lbs.
To cotton seed meal and acid phosphate plot	—50 lbs.
Average increase with kainit	**—3 lbs.**

Experiment made on the farm of the South East Alabama Agricultural School, Jackson, Clarke County.

Stiff, dark red, or "mulatto" soil; subsoil, red clay.

The experiment of 1899 was conducted by J. L. Ballard, that of 1900 by Prof. J. W. Culver. The field consisted of upland, cleared at least 10 years before the experiment began of its growth of long leaf and short leaf pine and oak. The land used for the experiment of 1900 had ben pastured for two years. No report was made of crops preceding the experiment of 1900.

The results of the two experiments may be found in the table on page 42 and in the analysis of that table given below.

In 1899 phosphate was by far the most effective fertilizer, though both cotton seed meal and kainit, as well as phosphate, were profitable when employed in a complete fertilizer.

In 1900, on ground not fertilized for several years previous to the experiment, all three fertilizing materials were exceedingly effective, all being of practically equal importance. This soil is unusually responsive to commercial fertilizers. A complete fertilizer afforded much the largest profit, both in 1899 and 1900.

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

	1899.	1900.
To unfertilized plot	136 lbs.	112 lbs.
To acid phosphate plot	—90 lbs.	179 lbs.
To kainit plot	—146 lbs.	356 lbs.
To acid prosphate and kainit plot	500 lbs.	855 lbs.
Average increase with cotton seed meal,	**103 lbs.**	**376 lbs.**

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

To unfertilized plot	336 lbs.	176 lbs.
To cotton seed meal plot	110 lbs.	243 lbs.
To kainit plot	—7 lbs.	234 lbs.
To cotton seed meal and kainit plot	639 lbs.	733 lbs.
Average increase with acid phosphate,	**269 lbs.**	**347 lbs.**

Increase of seed cotton per acre when kainit was used:

To unfertilized plot	115 lbs.	79 lbs.
To cotton seed meal plot	—167 lbs.	323 lbs.
To acid phosphate plot	—228 lbs.	137 lbs.
To cotton seed meal and acid phosphate plot	362 lbs.	813 lbs.
Average increase with kainit	**21 lbs.**	**334 lbs.**

Several experiments had been made previously on this farm. That of 1898 showed acid phosphate to be the most valuable single fertilizer, but that both kainit and cotton seed meal afforded such an increase as to make the complete fertilizer—which contained all three—the most profitable of all applications.

In 1897, when drought prevailed, only cotton seed meal was very effective.

Clearly a complete fertilizer is profitable on this soil, which lends itself readily to intensive farming.

Hurtsboro, Calhoun, Naheola and Jackson experiments with cotton.

Plot No.	Fertilizers. Amount per acre.	Fertilizers. Kind.	Hurtsboro. 1900. Yield seed cotton per acre.	Hurtsboro. 1900. Increase over unfertilized plots.	Calhoun. 1899. Yield seed cotton per acre.	Calhoun. 1899. Increase over unfertilized plots.	Naheola. 1899. Yield seed cotton per acre.	Naheola. 1899. Increase over unfertilized plots.	Jackson. 1899. Yield seed cotton per acre.	Jackson. 1899. Increase over unfertilized plots.	Jackson. 1900. Yield seed cotton per acre.	Jackson. 1900. Increase over unfertilized plots.
	Lbs.		*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs*	*Lbs.*
1	200	Cotton seed meal	512	154	548*	312*	536	56	960	136	552	112
2	240	Acid phosphate	6(8	240	718*	482*	512	32	1160	336	616	176
3	00	No fertilizer	368	....	236*	...	480	....	824	....	440	....
4	200	Kainit	440	83	366	107	520	13	968	115	520	79
5	200 240	Cotton seed meal Acid phosphate	616	270	1030	749	744	310	1128	246	808	355
6	200 200	Cotton seed meal Kainit	432	97	598	294	688	127	880	—31	880	435
7	240 200	Acid phosphate Kainit	680	357	904	678	576	—12	1048	108	760	313
8	00	No fertilizer	312	....	350	...	616	....	968	...	448	....
9	200 240 200	Cotton seed meal Acid phosphate Kainit	696	384	890	540	776	160	1576	608	1616	1168
10	200 240 100	Cotton seed meal Acid phosphate Kainit	720	408	780*	430*	800	184	1440	472	1520	1072

* Defective stand.

EXPERIMENTS MADE BY G. S. McCLURE, 2 MILES EAST OF GARLAND, BUTLER COUNTY.

Gray sandy land, with stiffer yellowish subsoil at depth of 6 inches.

The experiment in 1899 was made in a field cleared about 1880 and continuously in cultivation during each of the past six years. The test in 1900 was conducted on land that had been cleared about twelve years. The original growth was long-leaf pine, with a few black-jack oaks.

In both experiments oats was the preceding crop. There was practically no injury from "black rust" in 1900. In 1899 this disease caused considerable loss on Plot 2 and a smaller amount on plots 5 and 3, with practically no injury on other parts of the experiment.

The table on page 48 and the analysis of that table given below show the yield and amount of increase attributable to the fertilizers.

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

	1899.	1900.
To unfertilized plot	272 lbs.	96 lbs.
To acid phosphate plot	492 lbs.	336 lbs.
To kainit plot	252 lbs.	168 lbs.
To acid phosphate and kainit plot	40 lbs.	344 lbs.
Average increase wilh cotton seed meal,	**264 lbs.**	**236 lbs.**

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

	1899.	1900.
To unfertilized plot	152 lbs.	160 lbs.
To cotton seed meal plot	372 lbs.	400 lbs.
To cotton seed meal and kainit plot	154 lbs.	208 lbs.
Average increase with acid phosphate.	**261 lbs.**	**200 lbs.**

Increase of seed cotton per acre when kainit was added:

To unfertilized plot	226 lbs.	48 lbs.
To cotton seed meal plot	206 lbs.	120 lbs.
To acid phosphate plot	440 lbs.	—80 lbs.
To cotton seed meal and acid phosphate plot	—12 lbs.	—72 lbs.
Average increase with kainit	**216 lbs.**	**—4 lbs.**

In both years the most profitable fertilizer was a mixture of acid phosphate and cotton seed meal. Both cotton seed meal and acid phosphate, whether applied alone, or in combination, were highly profitable. Kainit had no beneficial effect in the presence of a mixture of phosphate and cotton seed meal, but in 1899, kainit was quite effective when used alone or in combination with either one (but not both) of the other materials; this was the season when rust was injurious on certain plots receiving no kainit.

Two experiments made in the same region by G. O. Sellans, at Lumber Mills, (see Bulletin No. 102) accord with Mr. McClure's experiments in showing that these soils are highly responsive to acid phosphate and cotton seed meal and that kainit is decidedly beneficial only in seasons when black rust is severe.

Experiment made in 1899 by C. H. Mason, ½ mile N. of Wilson, Escambia County.

Light sandy loam; with red clay subsoil.

This field of upland was cleared of its growth of long-leaf pine two years before the beginning of the test and during these two years the land was occupied by cow-peas, presumably grown for hay.

For yields of cotton seed see the table on page 48.

The following analysis shows that the one conspicuous need of this fresh land was for phosphate. The indifference of this particular field towards cotton seed meal is due to the recent clearing and to the two preceding crops of peas, both of which conditions imply the presence of considerable nitrogen in the soil. The soils of this region after a few years cultivation usually respond profitable to both phosphate and cotton seed meal, and some of them to kainit. A test made at Wilson on "new ground" in 1898 by J. H. Wilcox, gave results similar to those obtained in this experiment.

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

To unfertilized plot	200 lbs.
To acid phosphate plot	—112 lbs.
To kainit plot	24 lbs.
To acid phosphate and kainit plot	208 lbs.
Average increase with cotton seed meal	**108 lbs.**

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

To unfertilized plot	632 lbs.
To cotton seed meal plot	320 lbs.
To kainit plot	328 lbs.
To cotton seed meal and kainit plot	512 lbs.
Average increase with acid phosphate	**448 lbs.**

Increase of seed cotton per acre when kainit was added:

To unfertilized plot	8 lbs.
To cotton seed meal plot	—168 lbs.
To acid phosphate plot	—292 lbs.
To cotton seed meal and acid phosphate plot	24 lbs.
Average *decrease* with kainit	**107 lbs.**

EXPERIMENTS MADE IN 1899 AND 1900 BY T. M. BORLAND, ½ MILE S. W. OF DOTHAN, HENRY COUNTY.

Gray sandy land; subsoil yellowish.

The land was cleared of the original growth of long leaf pine nearly 10 years ago. In both cases the preceding crop was corn. Mr. Borland writes that peanuts were grown in 1899 between the corn rows on the area where the cotton experiment of 1900 was conducted.

Very hot dry weather in the latter part of the summer of 1899, and lice and excessive rafall in 1900 damaged the crop. The experimenter reports that rust was absent.

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

	1899.	1900.
To unfertilized plot	248 lbs.	56 lbs.
To acid phosphate plot	110 lbs.	20 lbs.
To kainit plot	119 lbs.	93 lbs.
To acid phosphate and kainit plot	123 lbs.	81 lbs.
Average increase with cotton seed meal,	**150 lbs.**	**63 lbs.**

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

	1899.	1900.
To unfertilized plot	208 lbs.	208 lbs.
To cotton seed meal plot	70 lbs.	172 lbs.
To kainit plot	227 lbs.	30 lbs.
To cotton seed meal and kainit plot	231 lbs.	18 lbs.
Average increase with acid phosphate,	**184 lbs.**	**107 lbs.**

Increase of seed cotton per acre when kainit was added:

To unfertilized plot	106 lbs.	201 lbs.
To cotton seed meal plot	—23 lbs.	238 lbs.
To acid phosphate plot	125 lbs.	23 lbs.
To cotton seed meal and acid phosphate plot	138 lbs.	84 lbs.
Average increase with kainit,	**87 lbs.**	**139 lbs.**

In both experiments a complete fertilizer afforded the largest increase in yield. A showing almost as favorable was made by the mixture of cotton seed meal and kainit.

The slight benefit from cotton seed meal in 1900 is probably due to the fact that peanuts were grown between the corn rows the year before. The experiment of 1900 makes the fourth test of fertilizers on cotton made on this farm. All these results point toward the need of all three of the fertilizer materials tested, kainit giving the largest average increase for the four years, viz.: 168 pounds of seed cotton per acre per annum. A similar average shows the increase with cotton seed meal to be 134 pounds, and with phosphate to be 122 pounds.

It is not surprising that this land, which has been in cultivation less than 10 years should be less responsive to cotton seed meal than are most of the soils of regions that were settled earlier. It also seems less responsive to phosphate and more so to kainit than do most of the soils on which tests have been made.

Garland, Wilson and Dothan experiments with cotton.

Plot No.	Fertilizers. Amount per acre.	Fertilizers. Kind.	Garland. 1899. Yield seed cotton per acre.	Garland. 1899. Increase over unfertilized plots.	Garland. 1900. Yield seed cotton per acre.	Garland. 1900. Increase over unfertilized plots.	Wilson. 1899. Yield seed cotton per acre.	Wilson. 1899. Increase over unfertilized plots.	Dothan. 1899. Yield seed cotton per acre.	Dothan. 1899. Increase over unfertilized plots.	Dothan. 1900. Yield seed cotton per acre.	Dothan. 1900. Increase over unfertilized plots.
	Lbs.		*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lcs.*	*Lbs.*
1	200	Cotton seed meal	664	272	504	96	280	200	840	248	424	56
2	240	Acid phosphate	544	152	568	160	712	632	800	208	576	208
3	00	No fertilizer	392	......	408	......	80	....	592	...	368	.....
4	200	Kainit	640	226	448	48	88	8	696	106	552	201
5	200 240	Cotton seed meal Acid phosphate	1080	644	888	496	600	520	904	318	560	228
6	200 200	Cotton seed meal Kainit	936	478	600	216	112	32	808	225	608	294
7	240 200	Acid phosphate Kainit	1072	592	456	80	416	336	912	333	528	231
8	00	No fertilizer	512	......	368	......	80	.....	576	......	280	......
9	200 240 200	Cotton seed meal Acid phosphate Kainit	1144	632	792	424	624	544	1032	456	592	312
10	200 240 100	Cotton seed meal Acid phosphate Kainit	1176	664	736	358	728	648	920	344	472	192

Inconclusive Experiments.

The three following tables give the yields obtained in tests that were altogether inconclusive:

The list on page 3 gives the names of the parties making the experiments at each of the localities referred to in the three tables that follow. In the case of some of these tests suggestions of value may reward a careful examination of the figures, but usually want of uniformity in the soil selected, or other vitiating condition, entirely destroys the worth of the experiments here tabulated.

Tuscumbia, Boligee, Berney and Hamilton experiments with cotton.

Plot No.	Fertilizers. Amount per acre	Fertilizers. Kind.	Boligee. 1899 Yield seed cotton per acre.	Boligee. 1899 Increase over unfertilized plots.	Berney's. 1899. Yield seed cotton per acre.	Berney's. 1899. Increase over unfertilized plots.	Berney's. 1900. Yield seed cotton per acre.	Berney's. 1900. Increase over unfertilized plots.	Hamilton. 1900. Yield seed cotton per acre.	Hamilton. 1900. Increase over unfertilized plots.	Tuscumbia. 1899. Yield seed cotton per acre.	Tuscumbia. 1899. Increase over unfertilized plots.	Tuscumbia. 1900 Yield seed cotton per acre.	Tuscumbia. 1900 Increase over unfertilized plots.
	Lbs		*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
1	200	Cotton seed meal	832	296	368	72	568	40	562	136	752	184	600	240
2	240	Acid phosphate	610	104	368	72	552	24	600	184	728	160	536	176
3	00	No fertilizer	536	....	296	....	528	....	416	....	568	.....	360	.....
4	200	Kainit	512	—16	418	155	575	49	568	125	784	252	296	—24
5	200 240	Cotton seed meal Acid phosphate	640	120	448	200	968	413	680	210	568	71	312	30
6	200 200	Cotton seed meal Kainit	632	120	480	197	704	181	668	171	410	—22	272	28
7	240 200	Acid phosphate Kainit	528	24	560	283	760	239	808	283	456	28	264	60
8	00	No fertilizer	496	.....	272	....	520	....	552	....	392	....	168	.....
9	200 240 200	Cotton seed meal Acid phosphate Kainit	448	—48	464	192	624	104	808	256	352	—40	480	312
10	200 240 100	Cotton seed meal Acid phosphate Kainit	278	—208	432	160	560	40	848	296	544	152	432	264

Sterrett, Dillbury, Marvyn, Oak Bowery and Greensboro experiments with cotton.

Plot No.	Fertilizers. Amount per acre.	Fertilizers. Kind.	Sterrett. 1899. Yield seed cotton per acre.	Sterrett. 1899. Increase over unfertilized plots.	Sterrett. 1900. Yield seed cotton per acre.	Sterrett. 1900. Increase over unfertilized plots	Dillburg. 1900. Yield seed cotton per acre.	Dillburg. 1900. Increase over unfertilized plots.	Marvyn. 1899. Yield cotton seed per acre.	Marvyn. 1899. Increase over unfertilized plots.	Oak Bowery. 1900. Yield ssed cotton per acre.	Oak Bowery. 1900. Increase over unfertilized plots.	Greensboro. 1899. Yield seed cotton per acre.	Greensboro. 1899. Increase over unfertilized plots.
	Lbs.		*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
1	200	Cotton seed meal	752	328	928	—184	976	508	376	96	120	—160	392	—24
2	240	Acid phosphate	640	216	1128	16	872	504	264	—16	280	00	584	168
3	00	No fertilizer	424	.....	1112	.....	.....	.....	280	.....	280	.....	416	....
4	200	Kainit	528	82	1120	00	568	200	472	170	368	95	576	166
5	200 240	Cotton seed meal Acid phosphate	744	275	1128	199	816	448	400	75	384	117	688	285
6	200 200	Cotton seed meal Kainit	712	221	1056	218	816	448	432	85	416	156	720	323
7	240 200	Acid phosphate Kainit	760	246	840	93	656	288	360	—10	408	154	504	114
8	00	No fertilizer	536	.....	656	.....	368	.....	392	.....	248	.....	384	.....
9	200 240 200	Cotton seed meal Acid phosphate Kainit	768	232	936	280	856	488	584	192	400	152	520	136
10	200 240 100	Cotton seed meal Acid phosphate Kainit	760	224	912	256	680	312	688	296	240	— 8	536	152

Calhoun, Greenville, Evergreen, Union Springs and Abbeville experiments with cotton.

Plot No.	Fertilizers. Amount per acre.	Fertilizers. Kind.	Calhoun. 1900. Yield seed cotton per acre.	Calhoun. 1900. Increase over unfertilized plots.	Greenville 1900. Yield seed cotton per acre.	Greenville 1900. Increase over unfertilized plots.	Evergreen 1899. Yield seed cotton per acre.	Evergreen 1899. Increase over unfertilized plots.	Union Springs. 1899. Yield seed cotton per acre.	Union Springs. 1899. Increase over unfertilized plots	Abbeville. 1899. Yield seed cotton per acre.	Abbeville. 1899. Increase over unfertilized plots.	Abbeville. 1900. Yield seed cotton per acre.	Abbeville. 1900. Increase over unfertilized plots.
	Lbs.		*Lbs.*	*Lbs*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
1	200	Cotton seed meal	444	80	1016	568	882	270	576	152	760	320	276	152
2	240	Acid phosphate	300	—64	968	520	764	152	441	20	656	216	184	40
3	00	No fertilizer	364	....	.....	....	612	.....	424	.....	410	....	144	....
4	200	Kainit	408	—7	960	5.2	808	196	.....	.....	552	137	208	27
5	200	Cotton seed meal	256	—210	1144	696	840	228	912	376	634	274	456	237
	240	Acid phosphate												
6	200	Cotton seed meal	640	123	848	400	896	284	496	—96	640	276	469	211
	240	Kainit												
7	240	Acid phosphate	664	96	576	128	1016*	404*	568	—80	416	79	368	71
	200	Kainit												
8	00	No fertilizer	620	.....	448	.....	904*	.....	701	.....	312	.....	336	....
9	200	Cotton seed meal	624	4	880	432	1420*	516*	776	72	584	272	608	272
	240	Acid phosphate												
	200	Kainit												
10	200	Cotton seed meal	644	24	768	320	1376*	462*	944	240	712	400	568	232
	240	Acid phosphate												
	100	Kainit												

* Not comparable with Plots 1—6, being in different part of field.

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Agricultural Experiment Station

OF THE

AGRICULTURAL AND MECHANICAL COLLEGE,

AUBURN.

Feeding Experiment with Dairy Cows.

By J. F. DUGGAR AND R. W. CLARK.

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Feeding Experiments with Dairy Cows.

BY J. F. DUGGAR and R. W. CLARK.

Summary.

With cotton seed at $8 per ton, cotton seed meal at $20, cotton seed hulls at $4, and sorghum hay at $6.67, butter was produced at a lower cost per pound on a ration consisting chiefly of raw cotton seed and hay than on one made up principally of cotton seed meal and hulls.

The cows did not greatly relish cotton seed and hence ate less than was desirable of the ration containing this; hence on the larger amounts eaten the oil mill ration afforded a larger daily yield of both milk and butter than did the farm-grown ration.

In two experiments the average daily amount of milk per cow was 17.5 pounds from the cotton seed ration and 24.3 pounds from the cotton seed meal ration; the daily production of butter per cow averaged .93 of a pound with the cotton seed and 1.19 with the oil mill ration, this being an increase of 38 per cent in milk and 28 per cent in butter. Nevertheless the low cost of the cotton seed ration made it the more economical, the average cost of the food required to make a pound of butter being only 10.4 cents when this ration was given and 15.3 cents when the hulls and meal ration was employed.

On account of the larger amounts of food consumed, the cows while receiving the cotton seed meal ration gained nearly half a pound a day in weight, while the cows eating cotton seed in smaller amounts lost .8 of a pound per day.

The cheapest butter was made by a Jersey heifer with her first calf, the food to make one pound of butter costing in this case only 6.4 cents when cotton seed was fed and 11.2 cents when cotton seed meal was given.

The manure (liquid and solid) dropped during the 16 hours of each day which the cows passed in the barn was carefully saved, analyzed, and applied to various crops.

The amount of manure, including sawdust bedding, per cow per night (of 16 hours) averaged 33.9 pounds when cotton seed was fed and 48.3 pounds when cotton seed meal was fed.

The manure made from the cotton seed and sorghum hay ration contained 10.7 pounds of nitrogen per ton; that from cotton seed meal and hulls contained 16.6 pounds, an increase of 55 per cent. in the amount of nitrogen per ton.

In percentages of phosphoric acid and potash the two manures were practically identical.

For one or two days the cows were kept stabled during the entire 24 hours and the amount of manure thus obtained (exclusive of bedding) was about double the amount secured by stabling the cows for 16 hours per day.

About one-half the manure was dropped out of doors.

Green rye at the rate of 52 to 54 pounds per day proved a satisfactory substitute for either sorghum hay or cotton seed hulls.

While the cows ate green rye the amount of milk slightly increased but the milk was slightly poorer than during the preceding period when only dry food was consumed.

An upland corn field from which the ears had been harvested, and in which cowpeas had been drilled between the corn rows, was grazed first by milk cows and later by dry cows, the milk cows meantime receiving 3 pounds of cotton seed meal per day.

On this pasturage the yield of milk was 15.8 per cent greater and of butter 9.5 per cent greater than when the cows with the same grain feed ran on a good pasture of bermuda grass, carpet grass, lespedeza, etc.

The value of the product of butter and of the increase in live weight of the cows averaged $4.47 per acre of corn and pea field grazed, after deducting the cost of the cotton seed meal fed at the same time.

INTRODUCTORY.

Under some conditions it is practicable for the dairyman to purchase a considerable proportion of the food which his cows consume. However, the temptation is to rely to too great an extent on purchased foods. These can be profitably used to a certain extent but rather as supplements to foods produced on the farm than as substitutes for farm-grown food. It is believed that any marked development of dairying and of beef production in the South is conditioned on the increased reliance on the foods which the fields and pastures produce. The feeder who buys thin cattle at a low price and, after a few months feeding, sells them at a higher price per pound, relies almost wholly upon cotton seed meal and hulls, but the stock raiser cannot afford to make the oil mill his principal depot of supplies.

Bearing in mind this necessity for avoiding large expenditures for purchased foods, we have planned a line of experiments intended to ascertain the extent to which farm-grown foods can be relied on in the feeding of dairy cows and the best crops for use as food in effecting this end.

The first experiments here reported are preliminary to this investigation and involve a comparison of a ration made up chiefly of the most economical of all purchased foodstuffs, cotton seed meal and hulls, with one consisting chiefly of cotton seed and sorghum hay, both of which latter materials can be grown on every farm in the cotton belt.

Purchased vs. Farm-Grown Ration in 1900.

The farm-grown ration consisted of cotton seed and sorghum hay, with small amounts of wheat bran and corn meal added to improve the palatability and to increase the amount of cotton seed consumed. The endeavor was to make each cow eat daily at least 9 pounds raw cotton seed, 10 pounds sorghum hay, 3 pounds wheat bran, and 3 pounds corn meal; and the foods were mixed in these proportions. As much of the mixture was given to each cow as she would eat clean.

The purchased, or "oil mill" ration consisted of a mixture of 5.25 pounds of cotton seed meal, 10 pounds of cotton seed hulls, 3 pounds of wheat bran, and 3 pounds of corn meal. This mixture was also fed in amounts as large as the cows would eat and the quantity consumed was greater than had been expected when the experiment was planned.

The following prices for food stuffs used in calculating the cost of butter are assumed as average prices in this State for a series of years, except that sorghum hay, for which there is no market, is charged as a price somewhat above its average cost of production:

Cotton seed	$ 8.00	per ton.
Cotton seed meal	20.00	per ton.
Cotton seed hulls	4.00	per ton.
Wheat bran	18.00	per ton.
Corn meal	20.00	per ton.
Sorghum hay	6.67	per ton.

The cows used were as follows:

NAME.	Breed,	Age.	Day sinces calving.	Weight when test began.
				Lbs.
Ada..........	Jersey......	8 years..	110	816
Queen........	Holstein....	8½ years..	81	980
Rozena........	Holstein ...	8½ years..	119	1150
Hypatia......	Jersey......	4 years..	19	733
Annie.....	Jersey	10 years..	80	762

The experiment was divided into two periods of four weeks each, each period being preceded by a preparatory period of one week during which the cows were accustomed to the food which they were to receive during the next period.

During the first period Ada and Queen received the cotton seed ration, Rozena and Annie meantime getting the ration of cotton seed meal and hulls. During the second period the rations were reversed, so that each lot of cows was fed for one whole period on each kind of food. Annie refused the cotton seed ration and hence in the second period it was necessary to substitute Hypatia.

Composite samples of the milk were tested weekly by the Babcock test and the amount of fat thus found was converted into butter by the usual method of multiplying by one and one-sixth.

Amount, kind and cost of food eaten.

Period. (each 28 days.)	Cow.	Pounds food in 28 days. Cotton seed.	Sorghum hay.	Cotton seed meal.	C. S. hulls.	Wheat bran	Corn meal.	Cost of food. In 28 days.	Per day.
									Cents.
I	*Jan. 16 to Feb. 12.*								
I	Ada....	287	286	......	......	95	95		
I	Queen..	246	233	......	......	72	72		
II	*Feb. 23 to Mar. 22.*								
II	Rozena.	290	270	......	.....	97	97		
II	Hypatia	193	212	......	... ..	64	64		
Total,	4 cows. ..	1016	1001	......	......	328	328	$13.57	12.1
II	Ada......	......	......	220	419	125	125		
II	Queen. ..	......	......	246	467	140	140		
I	Rozena...	......	......	251	478	143	143		
I	Annie....	......	......	161	307	92	92		
Total,	4 cows. ..	......	......	878	1673	500	500	$21.63	19.3

The cows receiving the "oil mill" ration ate much more heartily than the others, the cotton seed making the "farm-grown" ration relatively unpalateable. The amounts eaten daily per head were as follows, taking the average for four cows on each food:

	Lbs.		Lbs.
Cotton seed, raw......	9.07	Cotton seed meal	.7.83
Wheat bran	2.93	Wheat bran	4.38
Corn meal	2.93	Corn meal	4.38
Total concentrates..	14.93	Total concentr't's.	16.59
Sorghum hay	9.10	Cotton hulls	14.90
Total food	24.03	Total food.....	31.49

The average daily cost of food per day was 12.1 cents per cow with the farm-grown ration and 19.3 with the oil mill ration.

While it cost much more to feed the cows on the purchased ration, we may not pronounce this the least economical ration until we have noted the amount of butter produced by each.

Milk and butter produced by feeding a ration consisting largely of cotton seed and sorghum hay vs. one containing cotton seed meal and hulls.

Cotton seed and hay ration.				Cotton seed meal and hulls ration.			
Period.	Cow.	Milk.	Butter.	Period.	Cow.	Milk.	Butter.
		Lbs.	*Lbs.*			*Lbs.*	*Lbs.*
I	Ada..........	582.1	24 36	II	Ada...........	639.0	29.90
I	Queen.	586.0	27 76	II	Queen.	914.1	36.30
II	Rozena.......	638.3	29.00	I	Rozena........	1179 5	46.16
II	Hypatia......	514.7	28.60	I	Annie.........	639.1	34.90
Total,	4 cows, 28 days	2321.1	109.62	Total,	4 cows, 28 days	3371.7	147.26
Av.	Per cow, per day........	**20.7**	**.98**	Av.	Per cow per day	**29.6**	**1.31**

The product obtained was greater with the oil mill ration, the increase in milk being 43 per cent and in butter 34 per cent. This increased production of milk and butter with the purchased ration is due largely, if not entirely, to the larger quantities of food consumed.

If we take 20 cents per pound as the value of the butter and assume that the manure and skim milk have sufficient value to pay for the labor of caring for the cows and making the butter, we have the following statement of the cost and profit on butter.

Financial statement.

	With farm grown ration.	With oil mill ration.
Value of butter from 4 cows, 28 days	$21.92	29.56
Cost of food, 4 cows, 28 days	13.57	21.63
Profit from 4 cows, 28 days	8.35	7.93
Cost of food per pound of butter, cents........	12.1	15.2
Daily profit per cow, cents.......	7.5	7.1
Profit per pound of butter, cents......	7.9	4.8

The butter was produced at a cost of 12.1 cents per pound when the cotton seed and hay ration was fed and of 15.2 cents per day when cotton hulls and meal were fed in maximum amounts. Yet the daily production was so much larger on the last mentioned ration that the average daily profit per cow is nearly the same with both rations, viz. 7.5 cents with farm foods and 7.1 cents with oil mill products.

Second Experiment; Purchased vs. farm-grown ration in 1901.

In January and February 1901 the experiment of the preceding winter was repeated, with slight modifications in the rations.

The foods were mixed in the following proportions, and the cows were allowed to eat as much of each mixture as they would.

Farm grown ration.	*Purchased ration.*
9 lbs. raw cotton seed.	5.25 lbs. cotton seed meal.
3 lbs. wheat bran.	3 lbs. wheat bran.
10 lbs. sorghum hay.	10 lbs. cotton seed hulls.

Prices used in calculating the cost of butter are the same as in the former experiment.

The experiment extended over a similar period of time, two periods of 28 days each, both preceded by a week of preparatory feeding. The first period extended from January 1 to 28, 1901, the second from February 5 to March 4 inclusive.

Lot 1 consisted of two cows, and Lot II of three cows. The different number of cows in the two lots does not affect the accuracy of the results, for at the conclusion of the first period the rations were reversed, thus making each cow at different times during the experiment consume both rations.

The cows employed were as follows:

	Breed.	Age. Years.	Days since calving.	Weight when test began.
Ida	Jersey	5	110	810
Hypatia	do	5	16	740
Annie	do	11	37	795
Ada	do	9	48	830
Susan	do	3 (1st calf)	141	610

Amount, kind, and cost of food eaten.

Period.	Cow.	Lbs. food in 28 days.					Cost of food.	
		Cotton seed	Sorghum hay.	Cotton seed meal.	Cotton seed hulls.	Wheat bran	In 28 days	Per day.
								Cents.
I	Ida	258	207	....	....	86		
I	Hypatia	275	242	....	....	92		
II	Annie	175	135	....	....	58		
II	Ada	200	180	....	....	66		
II	Susan	168	162	....	....	56		
Total,	5 cows	1076	926	....	....	358	$10.61	7 5
II	Ida	....	....	235	449	134		
II	Hypatia	....	....	272	519	155		
I	Annie	....	....	193	368	110		
I	Ada	....	....	256	490	147		
I	Susan	....	....	189	360	108		
Total,	5 cows	....	....	1144	2186	654	$21.60	15 4

As in the former experiment we were unable to induce the cows to eat the desired amount of the cotton seed ration.

The food consumed per head daily averaged as follows:

	Lbs.		Lbs.
Cotton seed, raw ...	7.68	Cotton seed meal...	8.17
Wheat bran	2.56	Wheat bran	4.66
Total concentrates..	10.24	Total concentrates..	13.83
Sorghum hay	6.61	Cotton seed hulls...	15.60
Total food	16.85	Total food	29.43

The average daily cost of food was 7.5 cents per cow with the farm-grown ration and 15.4 cents with the oil mill ration. However, the more expensive ration gave the larger product, as appears below:

Milk and butter produced by feeding in 1901 a ration consisting largely of cotton seed and sorghum hay versus one containing cotton seed meal and hulls.

Cotton seed and hay ration.				Cotton seed meal and hulls ration.			
Period.	Cow.	Milk.	Butter.	Period.	Cow.	Milk.	Butter.
		Lbs.	*Lbs.*			*Lbs.*	*Lbs.*
I	Ida..........	359.2	21.09	II	Ida..........	523.8	29.00
I	Hypatia.....	532.7	30.44	II	Hypatia.....	640.3	26.73
II	Annie.......	380.9	22.42	I	Annie.......	607.8	32.22
II	Ada	409.5	22.70	I	Ada..........	549.2	28.79
II	Susan........	318.6	26.39	I	Susan........	446.3	31.76
Total...	5 cows, 28 d'ys	2000.9	123.04	Total...	5 cows, 28 d'ys	2767.4	148.50
Av. per	cow per day	**14.36**	**.88**	Av. per	cow per day	**19.0**	**1.06**

The purchased ration afforded an increase over the farm-grown ration of 32 per cent. in milk and 21 per cent in butter. Of course this increase must be attributed chiefly to the fact that larger amount of the former were consumed on account of its greater palateability.

With butter at 20 cents per pound and food stuffs at same prices as in the former experiment we obtain the following:

Financial Statement.

	With farm-grown ration.	With oil mill ration.
Value of butter from 5 cows, 28 days.......	$24.61	$29.70
Cost of food, 5 cows, 28 "	10.61	21.60
Profit from 5 cows, 28 "	14.00	8.10
Cost of food per pound of butter, cents.	8.6	15.4
Daily profit per cow, cents	10.0	5.8
Profit per pound of butter, cents	11.4	4 6

The farm-grown ration afforded a greater profit whether we use as a basis the daily profit per cow or the profit on each pound of butter; this latter profit was 11.4 cents when the cotton seed ration was fed and 4.6 cent when the meal and hulls ration was employed.

Attention is called to the excellent record made by the Jersey heifer Susan.

Although she had calved nearly five months before her experimental feeding began, yet she averaged 1.14 pounds of butter per day during the 28 days while receiving cotton seed meal.

AVERAGE RESULTS OF THE TWO EXPERIMENTS.

Taking the averages of the figures in the two experiment we find:

	With cotton seed ration. Cents.	With oil mill ration. Cents.
Cost of food per pound of butter........	10.35	15.3
Daily profit per cow	8.75	6.45
Daily production of butter per cow, lbs...	.93	1.19
Daily production of milk per cow, lbs...	17.53	24.3

With the oil mill ration the daily production of butter was larger by 28 per cent and the daily flow of milk by 38 per cent. But the amount of food consumed, and hence the daily cost, was so much greater than with the farm-grown ration that the latter was decidedly more profitable.

EFFECTS OF RATIONS ON WEIGHT AND HEALTH OF COWS.

Effect of food on live weight.

	Period beginning.	Weight at beginning	Weight at end of period.	Gain (+) or loss (—) in 28 days. On farm ration	On oil mill ration.
Ada	Jan. 16, 1900	816	832	+ 16	
Queen	do	980	970	— 10	
Ada	Feb 23, 1900	862	861	....	— 1
Queen	do	1003	1072	....	+ 69
Rozena	Jan. 16, 1900	1150	1175	....	+ 25
*Annie	do	762	775	....	+ 13
Rozena	Feb. 23, 1900	1152	1165	+ 13	
*Hypatia	do	703	705	+ 2	
Ida	Jan 1, 1901	810	765	— 45	
Hypatia	do	740	700	— 40	
Ida	Feb. 5, 1901	790	795	....	+ 5
Hypatia	do	730	755	....	+ 25
Annie	Jan. 1, 1901	795	767	....	— 28
Ada	do	830	840	....	+ 10
Susan	do	610	610	....	0
Annie	Feb. 5, 1901	745	697	— 48	
Ada	Feb. 5, 1901	845	780	— 65	
Susan	Feb. 5, 1901	610	585	— 25	
Total net gain				—202	+ 118
Average per cow, per period of 28 days				22.4	13 3
Average per cow, per day				— .8	+ .5

* Hypatia substituted for Annie in 2d period.

The gains in live weight during the first two feeding periods are not of particular interest so far as the rations are concerned, but they seem to depend upon the individuality of the cows. Ada gained 16 lbs. on the farm-grown ration and practically held her own on the "oil mill ration" losing only 1 pound. Queen lost

10 pounds on the farm-grown ration and gained 69 lbs. on the "oil mill ration." With the other two cows there was a slight gain in both periods.

On an average the cows on cotton seed lost in weight .8 of a pound per day, while those on the meal and hulls ration, consuming more food, gained .5 of a pound daily. The rations fed during the second experiment were decidedly laxative and the cows showed it in the milk yield and in the loss of live weight. In 1900 the raw cotton seed fed constituted 37.7 per cent of the "home-grown ration," while in 1901 it constituted 45.50 per cent of the "home-grown ration."

In 1900 the cotton seed meal fed formed 24.8 per cent of the "oil mill ration" and in 1901 it formed 27.7 per cent.

The table of live weight shows that in the second experiment all the cows lost in weight when on the farm-grown ration, while only one fell off on the "oil mill ration." The effect of cotton seed and cotton seed meal varied with the different animals, the greatest scouring being with cotton seed. In the first experiment Rozena, a very large cow, consumed an average of 8.9 pounds of cotton seed meal daily and appeared well in every way, while in the second period she consumed 9.6 pounds of cotton seed and did not show the effects for three weeks, when she scoured very heavily and fell off in milk flow. This was undoubtedly due to the large amount of oil in the cotton seed. In the second experiment Susan, a small heifer, took 6 pounds of cotton seed per day for the first period and appeared at her best during the whole of the month, but six days after being on cotton seed meal in the second period, getting 6.7 pounds per day, she commenced to scour and fell off in milk flow. This could not be due to a larger amount of oil in the ration, but probably to the influence of the previous month's feeding of cotton seed, modified by the individuality of the cow. A cow that scours, even though it be slight, can not do her best at the pail.

In feeding cotton seed and cotton seed meal, as well as other feed stuffs, one must not rely on tables entirely, but be guided largely by the individuality of the animal with which he is dealing. The amounts of cotton seed meal used in the above experiments are larger than the writers would advise.

THE AMOUNT AND QUALITY OF MANURE COLLECTED FROM COWS ON DIFFERENT RATIONS.

First experiment, 1900. The manure, both liquid and solid, was saved every day, except that dropped when the cows were out of the barn and in bare lots where they spent the time between 8 a. m. and 4 p. m. Hence the manure actually saved consisted only of that dropped during 16 hours of each day, or of that voided during two-thirds of the time.

The liquid manure was saved by the use of sawdust as bedding material. The manure was removed every day to a shed, the roof of which consisted of 12-inch boards without battens, and hence having small cracks every twelve inches. This leak kept the manure moist but seems not to have resulted in any appreciable amount of leaching.

The manuure (including sawdust) collected during the time that the cows stood in the barn was as follows:

	Lbs. in 28 days, 2 cows.	Lbs. daily per cow.
From cotton seed and hay ration, 1st 28 days........	1785	
From do 2nd 28 "	1700	
Total and average..................	3485	31.04
From cotton seed meal and hulls ration, 1st 28 days.	2115	
From do 2nd 28 "	2430	
Total average	4545	40.6

These several lots of manure were applied to various farm crops; to ascertain the real or agricultural value of the two kinds of manures we must wait until the crop returns for several years can be reported.

No analyses of the manure was made in the experiment conducted in 1900.

The bedding used was fresh yellow fine sawdust, which in the first experiment was dry enough, but that used in the experiment of 1901 was too moist to be entirely satisfactory. The amounts of sawdust used per period (and included in the figures given above for manure) were with the cotton seed ration 391 and 639 pounds in the respective periods; with the cotton seed meal ration 520 and 644 pounds, respectively.

Second experiment, 1901. The same method as in 1900 was employed in collecting and handling the manure dropped during the 16hours per day that the cows spent in the barn. Only during the second period of this experiment was the manure kept separate and weighed.

The weights given are those obtained by weighing the bulk of manure and soiled bedding at the conclusion of the experiment.

The data follows:

	Lbs. manure from 2 cows, 28 days.	Lbs. manure daily per cow.
From cotton seed and hay ration....	1900	35.7
From cotton s. meal and hulls ration.	3138	56.0

These two lots of manure, each collected during parts of 28 days, were applied to farm crops, and the effects of these two classes of cow manure as compared with each other, with commercial fertilizers, and with no fertilizer, will be recorded in future bulletins of this Station.

The two lots of fertilizers collected as above during the last 28 days of the experiment, were carefully sampled at the end of the experiment and promptly analyzed; and the following table gives the results calculated by us from the analyses made by the chemical department of the Station:

Nitrogen, phosphoric acid, and potash in cow manure, 1901.

	From cow manure.	
	Cotton seed and hay ration.	C.S meal and hulls ration.
*Composition.**		
Nitrogen, ... per cent	0 535	0.830
Phosphoric acid, per cent	.340	0 350
Potash, ... per cent	.500	0.485
Moisture, . per cent	64.00	66 140
Pounds in 1 ton of manure.		
Nitrogen, ... lbs	10 7	16 6
Phosphoric acid, ... lbs	6.8	7 0
Potash, ... lbs	10.0	9 7

The matter that is most worthy of note in the table above is the fact that manure made from a diet consisting largely of cotton seed meal and hulls is 55 per cent. richer in nitrogen than that made from the cotton seed and hay ration; a ton of the former contains 16.6 pounds of nitrogen as compared with 10.7 pounds of nitrogen in the manure from the latter or farm ration. As regards phosphoric acid and potash the two manures are on a practical equality.

* In 1901 the manure dropped during the day when the cows were confined for the *entire 24 hours* was also analyzed, the comparison being almost exactly the same as that of the manure saved during the second period of 28 days (see table above). There was in this fresh manure made from cotton seed, etc., 68 3 per cent. moisture; 0 515 per cent. nitrogen; 0 30 per cent. phosphoric acid; 0 39 per cent. potash. In the manure made from cotton seed meal the percentages were respectively, 68 37; 0.78; 0 325; 0.40. The only notable difference is in the nitrogen, of which the manure from the oil mills ration contained 51 per cent. more than was found in the cotton seed ration.

Proportion of total excrement dropped in barn.

In order to determine what proportion of the manure was dropped in the barn and what percentage in the lots during the eight hours that the cows daily passed in the latter, two cows getting the farm ration and two receiving the purchased foods were kept in the barn for 24 and 48 hours after the close of the experiment, the rations meantime being continued without change.

Solid & liquid excrement per cow in 24 hours.

Cotton seed ration.				Cotton seed meal ration.			
Cows.	Date.	Total excrement and sawdust.	Solid and liquid excrement.	Cows.	Date.	Total excrement and sawdust.	Solid and liquid excrement.
		Lbs	*Lbs.*			*Lbs.*	*Lbs.*
Ada and Queen	Feb. 13 & 14, 1900	55 8	47.8	Ada and Queen	Mar. 23&24, 1900	87 2	72.6
Rozena & Hypatia.	Mar. 23&24, 1900	73 1	56.8	Rozena & Annie.	Feb. 13& 14, 1900	61.5	46.1
Ada and Susan.	Mar 6, 1901 ...	53.8	..	Queen & Hypatia.	Mar. 6, 1901....	103 8	
Average ...	per cow	60.9	...	Average ...	per cow	84.2	
Average ...	per 1000 lbs live weight.	72 5		Average. ..	per 1000 lbs. live weight.	89 3	

The average amount of solid and liquid droppings and bedding per cow was 60.9 pounds per day with the ration containing cotton seed and 84.2 pounds per day with the ration containing cotton seed meal.

In 1900, with the cotton seed ration, the average amount of solid and liquid excrement dropped per cow in 24 hours (excluding bedding) was 52.3 pounds; the average daily amount of excrement (free from sawdust) collected during the 16-hour stabling period of each day was only 21.9 pounds.

In 1900, with the cotton seed meal ration, the average amount of excrement, free from sawdust, dropped per cow in 24 hours was 59.4 pounds; the average amount collected during the 16 hours of stabling was only 30.2 pounds.

Apparently about one-half the manure was dropped in the barn and about one-half in the lots.

This statement is important because the manure dropped on the lots or pastures usually suffers greater losses, and hence is worth less than that collected while the cows are in the stable. However, the high value of manure from grain fed cows should prompt every dairyman to gather and protect the manure from the lot as well as that from the barn.

In conclusion let us note that the manure from the cotton seed meal ration was greater in amount and much richer in nitrogen than that from the cotton seed ration. Taking the average amounts of manure in all cases where the cows were confined for the whole day and using the analysis of the samples collected in the last periof of 28 days in 1901, we find that the daily excretion of liquid and solid excrement (including bedding) contained plant food as follows:

	Lbs. nitrogen.
60.9 lbs. manure from cotton seed ration.........	.306
84.2 lbs. manure from cotton seed meal ration....	.709

With the cotton seed meal ration the daily output of nitrogen in the manure was more than twice as great, and the amounts of phosphoric acid and potash considerably larger than with the ration made up largely of cotton seed.

Green rye substituted for cotton seed hulls and for sorghum hay.

For 3 weeks beginning March 22, 1900, the four cows which had been used in the experiment comparing a farm-grown with a purchased ration, were fed on green rye as a substitute for the cotton seed hulls and for the sorghum which they had been eating during the second period. The grain ration of the second period was continued in same proportions but in greatly reduced amounts. The rye was in full bloom and rather too old. Excluding the first, or preliminary, week, we find that the result for period III, consisting of 14 days, were as stated below:

Food consumed and milk and butter afforded by 2 cows in 14 days from different rations.

	Lbs. food in 14 days.				Gain or loss in weight	Cotton seed ration.		Cotton seed meal ration.	
	Green rye.	Cotton seed.	Cotton seed meal	Bran and corn mixture. 1:1.	*Lbs.*	Milk. *Lbs.*	Butter. *Lbs.*	Milk. *Lbs.*	Butter. *Lbs.*
Ada......	773	...	50 0	36 0	+ 8	.....	....	298.9	12 73
Queen....	689	....	73.4	83 9	— 32	.....		424.0	13.33
Rozena..	783	88 8	....	59 8	— 7	364 8	13 15	......	.....
Hypatia...	731	52 8	.....	35.2	— 14	272 9	15 27	......	......
Total, 2 cows	....		....	......	......	**637.7**	**28 42**	**722.9**	**26 06**

Counting green rye at $2.00 per ton and other food-stuffs at prices before mentioned, we find that the cost of food to make one pound of butter was 15.4 cents when cotton seed meal was fed and only 10.5 cents when cotton seed was fed.

This difference in favor of cotton seed over cotton seed meal as an economical producer of butter is apparently too great to be attributed to individual peculiarities of the cows of the two lots, which were chosen with reference to their practical equality.

Direct comparison of green rye as a substitute for either cotton seed hulls or sorghum hay can not be made in this experiment. However the substitution of rye for cotton seed hulls, and also for sorghum hay, reduced the cost of butter, partly perhaps because the large amount of green rye eaten made it practicable to reduce the amount of concentrated food.

Comparing the average daily product during period III with that of the last two weeks of period II, and making no allowances for the fact that the cows while on rye were further removed from time to time of calving than when receiving sorghum or cotton seed hulls, we find:

(1) That the substitution of 52 lbs. of green rye for 14.9 lbs. of hulls (grain also being reduced when rye was fed thus changing the nutritive ratio from 1:4 to 1:3.7), was accompanied by a shrinkage of 19 per cent. in butter and 9 per cent in milk.

(2) That the substitution of 54 lbs. of green rye for 9.1 pounds of sorghum hay (grain also being reduced when rye was fed, changing the nutritive ratio from 1:6.5 to 1:7.3) increased the yield of milk by 18 per cent. and the yield of butter to the extent of 6 per cent.

The results of feeding rye were highly satisfactory for they show that rye was practically able to maintain the normal product (actual yield corrected for advance in location) of butter and to slightly increase that of milk and that its use allowed the daily ration of concentrated food to be decreased to the extent of more than 5 pounds per day, without materially impairing the amount of product. These facts and figures point to an increased use of green crops in late winter and early spring as an effective means of reducing the bill for purchased foodstuffs. An uninterrupted succession of crops for feeding green (soiling) may be had by the use of rye, wheat, common oats, hairy vetch (mixed with small grains), turf oats, and sorghum, etc.

Since the health and working capacity of cows are so greatly improved by soiling crops they should find increased favor.

EFFECT OF GREEN FOOD ON RICHNESS OF MILK.

It is a common belief that milk made from green food contains more water and less fat than that from dry foods. The results of the few experiments made on this point do not bear out the popular belief.

Our results on this point were obtained by making a composite test for butter fat, once a week.

It should be recollected that these determinations of fat were not begun until after the cows had been eating rye for a week. For comparison, we give the percentages of fat found in the milk of the same cows for the weeks beginning March 9 and March 16, 1900, at which time they were receiving only dry food, and a heavier grain ration (though similar in kind) than was given with the rye.

Per cent. of fat in milk; results of composite weekly tests.

Name.	On dry food, and heavy "grain" ration. Date.	Per cent. fat.		With green rye, and moderate "grain" ration. Date.	Per cent. fat.		Loss on green food.
							%
Ada........	Mar. 9–15...	3 7	3.85	Mar. 30-A.5.	3.5	3.65	.20
	Mar. 16–22..	4 0		Apr. 6–12...	3.8		
Queen......	Mar. 9–15..	3.2	3.30	Mar 30-A. 5.	3.	2.90	.40
	Mar. 16–22	3.4		Apr. 6–12...	2.8		
Rozena.....	Mar 9–15 ..	4.1	4.15	Mar. 30-A. 5	3.0	3.10	1.05
	Mar. 16–22..	4.2		Apr. 6–12...	3.2		
Hypatia....	Mar. 9–15...	5.0	4.80	Mar. 30-A. 5	4.8	4.80	.00
	Mar. 16–22..	4.6		Apr. 6–12...	4 8		
Average decrease in % fat	......	.....		....	....		.41

The uniformity of the figures indicate a decrease in per cent. of fat in the period when rye was fed. It cannot now be said whether it was due to the green food, to temperature conditions, or to a large reduction in the grain ration. The effect of green foods as fed in the South on the percentage of fat in the milk requires further study.

DIGESTIBLE NUTRIENTS IN THE SEVERAL RATIONS FED.

The following table given the amount of digestible nutrients consumed per day in the different periods in comparison with the German or Wolff-Lehmann Standard, which represents the daily requirements of an average cow in full flow of milk:

Digestible nutrients in rations fed.

Ration.	Average weight of cows.	Dry matter.	Digestible nutrients: Protein.	Carbohy-drates.	Ether extract.	Milk per day.	Nutritine ratio.
	Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
Wolff–Lehmann Standard.	1000	29	2.5	13	.5	22	1:5.7
"Farm-grown," 1900..	915	18 75	1 85	9.21	1 81	20.7	1:7.3
"Oil mill," 1900.......	957	28.19	3.82	11 98	1.01	29 6	1:3.7
"Farm-grown," 1901.	772	13.07	1.37	5.76	1.42	14.3	1:6.6
"Oil mill," 1901.......	752	25 46	3.64	8.36	1.38	19.0	1:3.2
Rye & cotton s., 1900..	970	20 9	2 2	11.2	1 31	22.7	1:6.5
Rye & c. s. meal, 1900.	960	20.6	3.21	10 71	.90	25.8	1:4.0

Speaking in general terms, protein is that part of the food that goes to make milk, muscle, bone, etc., while carbohydrates (starch, sugar, etc.) and ether extract (fat, etc.) are used as fuel and to give force. Protein is nitrogenous material, and carbohydrates and ether extract are non-nitrogenous. Both classes of compounds must be present in the food to keep the body in its normal working condition.

The average daily ration per cow was as follows:

Cotton seed ration—
- 5.6 lbs. cotton seed.
- 3 7 lbs. bran and corn mixture.
- 54 lbs. green rye.

Cotton seed meal ration—
- 4.4 lbs. cotton seed meal.
- 5.0 lbs. bran and corn mixture
- 52 lbs. green rye.

It should be noticed that the cowing eating the cotton seed ration could never be brought up to full feed, or the amount necessary to produce a full flow of milk; in one experiment their ration dropped nearly down to half what the Germans have found to be desirable for a cow to eat.

On the other hand the cows getting cotton seed meal in all cases consumed more protein than necessary.

The nutritive ratio is the number of times that the ratio of the amount of protein (taken as 1) to the total amounts of carbohydrates and fats, the fats having first been multiplied by 2¼. The nutritive ratio was narrow (represented by a small number) when cotton seed meal was fed, and wider (or less rich in nitrogen or protein) when cotton seed was fed.

VALUE OF COWPEAS IN CORN FIELDS AS PASTURAGE.

For a period of 19 days, October 7 to 25 inclusive, 1900, three Jersey cows were grazed in a corn field from which the ears had been pulled, the grazing consisting principally of cowpeas, of what remained of the corn blades, and of a little crab and crowfoot grasses.

The corn was planted March 28 in rows five feet apart. Half way between the corn rows was a row of drilled Wonderful cowpeas planted June 4, without fertilizer. The yield of corn was about 25 bushels per acre.

While the cows were grazing in the corn field on cowpeas each received a daily allowance of 3 pounds of cotton seed meal.

From September 23 to October 6 each cow also consumed 3 pounds of cotton seed meal per day. During this earlier period of three weeks, they grazed in a large pasture of bermuda, lespedeza, (Japan clover, carpet grass, etc.) so that the yields made on pea vines can be properly compared with those made on ordinary pasturage. The following table shows the amount of milk and butter afforded daily by each cow:

Average amount of milk and butter produced daily.

Cow.	Milk from		Butter from	
	Mixed pastur'ge.	Cowpeas, etc.	Mixed pastur'ge.	Cowpeas, etc.
	Lbs.	*Lbs.*	*Lbs.*	*Lbs.*
Ida..................	23.94	25.53	1.03	1.13
Houron................	9.72	15.5	.81	.97
Susan.................	17 64	18.37	1.00	1.01
Average per cow. daily	17.1	19.8	.95	1.04
Per cent. increase ..	....	15 8	....	9.5

Comparing the product obtained when the cows grazed on cowpeas with that made from ordinary pasturage, we find that the cowpeas gave an average increase of 15.8 per cent in milk and 9.5 per cent in butter. It should be noted that this increase occurred in spite of the fact that the cows were further advanced in the period of lactation when grazing on cowpeas than when on ordinary pasture.

The total amount of product obtained from the three cows during the 19 days while they grazed on cowpeas in a corn field of 3.03 acres was 1129.5 pounds of milk and 59.17 pounds of butter. During this time the three cows consumed a total of 171 pounds of cotton seed meal.

The three cows Ida, Susan, and Houron, during the 19 days while pasturing on cowpeas made gains in live weight of 2687 pounds, subsisted for a period of 85 pounds for the lot. When the field was grazed so close as to threaten to reduce the milk flow, these three cows were removed and three dry Jersey cows were substituted. These three dry cows, with a total initial weight of 2687 pounds, substituted for a period of 9 days on what remained of the grazing on 3.03 acres, meantime receiving no other food whatever and making gains of 12, 16, and 25 pounds, a total of 53 pounds for the lot. Adding this to the 85 pounds gained by the cows giving milk, we have a total gain in live weight of 138 pounds.

The returns from grazing 3.03 acres of cowpeas are brought out by the following:

Financial statement.

By 59 17 lbs. butter, @ 20c		$11.80
By 138 lbs. increase in live weight, @ 2½c		3.45
To 171 cotton seed meal, @ $20	$ 1.71	
Balance (value of 3.03 acres pasturage)	13 54	
Total	$ 15.25	$15 25

Since $13.54 represents the returns from 3.03 acres, the value of the grazing on one acre is $4.47.

The peas were planted for their fertilizing value and the butter removed practically none of this. Hence the cost of growing the peas should be charged in the fertilizer bill of the following crop, and not to the butter produced. However, if it be insisted that this is a proper charge against the cows the expense consists only of the cost of seed, labor of dropping and of covering, the total being somewhat less than a dollar per acre.

If we charge all of this expense of growing the peas to the cows giving milk and entirely neglect the gains made in live weight (the value of which was greater than the cost of growing the peas) the cost of concentrated feed and of pasturage was 8 cents per pound of butter. Balancing gains in live weight against cost of making the pea crop, we have 2.9 cents as the cost of purchased food per pound of butter.

Since there are more farmers interested in beef production than in commercial dairying, we have made an estimate as to the amount of growth of beef cattle that might be expected on an acre, using Thorne's figures as to the relative amounts of food required to make a pound of butter and of beef. By this method we estimate that an acre of grazing of this character made without the aid of any other food, animal products equal to about 80 pounds of increase in live weight. This is confessedly only an estimate but it is in accord with the small amount of data from other sources which is available on this subject.

BULLETIN No. 115. AUGUST, 1901.

ALABAMA

Agricultural Experiment Station

OF THE

AGRICULTURAL AND MECHANICAL COLLEGE,

AUBURN.

COMMERCIAL FERTILIZERS

JAS. T. ANDERSON,

Acting Chemist.

A. ROEMER,
PRINTER FOR STATE OF ALABAMA,
MONTGOMERY, ALA.
1901.

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The Bulletins of this Station will be sent free to any citizen of the State on application to the Agricultural Experiment Station, Auburn, Alabama.

*To be filled.

AUBURN, ALA., July 24, 1901.

HON. R. R. POOLE,

Commissioner of Agriculture,

Montgomery, Alabama.

DEAR SIR:

I have the honor to submit herewith, in tabulated form, a report of the results of analyses of commercial fertilizers and miscellaneous fertilizing materials for the year ending July 1st.

A large majority of these samples were forwarded to this laboratory through your office, and certificates of analysis were furnished you from time to time as the work was finished. A large number, however, were sent direct to us from dealers and consumers, and in all these cases certificates of analysis were sent direct to the parties.

In addition to the analysis reported in this bulletin, analyses, both quantitative and regulative, of various miscellaneous substances—ores, marls, minerals, waters, dairy products, &c.—have been made for parties from all sections of the State, and have been reported from time to time.

As an introduction to the tables, I respectfully submit a few observations on "Fertilizers—their selection and use," which, it is hoped, will prove of some practical value to the farmers who receive this bulletin.

Very respectfully,

JAS. T. ANDERSON,

Acting State Chemist.

Fertilizers--Their Selection and Use.

Few farmers need be reminded of the necessity of applying fertilizers in some form to their soils in order to maintain their fertility and to increase their crop producing power. The question is not "Shall I fertilize?" but rather "What fertilizers shall I use?" It is proposed in this brief discussion to offer a few suggestions which it is hoped, will be of some value in this connection. These must be taken as suggestions merely, and not as absolute guides in solving the problem. In the present state of knowledge of the science of agriculture, it is impossible to state any general principle of soil fertilization which will be of universal application, so complex are the conditions and requirements to be considered. The character of the soil and the method of its cultivation, the crop to be grown, the season—all these are to be considered in devising any rational system of fertilization.

A soil is fertile when it contains all the materials necessary for plant growth in the required quantity and in the proper form. A soil which is lacking in any of these materials, or which does not have them in the proper form, is in no condition to produce a full crop, and must have the deficient material supplied in the proper amount and form in order to make it productive. As has frequently been stated in these bulletins, there are about a dozen constituents of the soil that are required for plant nutrition. Most of these are found in such quantity in the soil, or are in such little demand by the plant, that the supply of them in the soil is not likely to be exhausted by years of cultivation. Three of the constituents, however, nitrogen, phosphoric acid and potash, are in such demand by the plant that their supply is readily exhausted, and it is necessary to restore these exhausted constituents to the soil in order to make it fertile. For the present, then, soil fertilization consists in restoring to the soil nitrogen, phosphoric acid and potash in such quantities in assimilable form as may be required for the proper nutrition of the growing crop. The rational course, therefore, to pursue with reference to a given soil is first to determine its deficiency in these three constituents and then to supply the deficiency in proper form.

It is not an infrequent occurrence for this department to receive a sample of soil with the request to tell what it needs for its proper fertilization. The correspondent is acting on the hypothesis that a chemical analysis of a soil will determine its fertilizer requirements. Unfortunately it will not do so satisfactorily. The chemist can easily determine what constituents are present in the soil and in what quantities, but he cannot so readily determine whether these constituents are present in assimilable form, and if they are not present in assimilable form, they might as well be absent altogether, as far as the present needs of the growing plant are concerned. Many agricultural chemists, in this and other countries, are seeking to discover methods for determining available or assimilable plant food in soils, but at present there is no such method known which is satisfactory and which admits of universal application.

If chemical analysis fails to answer the question, it may be asked, is there not some way by which the solution may be found? In answer let us quote the language of Dr. Armsby of the Pennsylvania station: "The most satisfactory, and, indeed, usually the only method by which we can at present determine the needs of the soil is to ask the question of the soil itself by growing a crop upon it with different kinds of fertilizers and noting the results. Such soil tests with fertilizers have in many cases given results of much immediate practical value for the locality in which they where undertaken."

On this plan have been conducted for several years the Cooparative fertilizer tests for cotton under the direction of Professor Duggar of the Agricultural Experiment Station of this State, and much valuable information has been accumulated thereby. It would be highly advantageous to the agricultural interests of the State if this work could be greatly extended beyond its present limits. It seems to the writer quite feasible for each intelligent farmer to conduct the experiments for himself and thus secure data that would be highly useful to him. At first glance they may seem complicated and expensive, but in reality they are neither so difficult nor so expensive as they seem. For the benefit of any farmers who may desire to make them the following suggestions are offered:

Select ground that represents fairly as large an area of the farm, and whose soil is as uniform in character as possible. A long strip of land is likely to be more representative in character than a square piece, as it will contain more of the inequalities of the soil, and for this reason is to be preferred for the purpose of these experiments. The land should be as level as possible, and if not level, the plots should be so located that the fertilizers cannot be carried by rain from one plot to another. No part of the strip should be shaded by trees. A convenient size would be 33 feet wide by 416 feet long divided into 6 equal plots each 66 feet long, with a path 4 feet wide between the plots. Each plot, therefore, would be 33x66 feet and measuring exactly one-twentieth of an acre. Each plot should be separated from its neighbor plots, as well as from adjacent cultivated ground, by a 4 ft. path, so that the roots of the plants grown on it can get no fertilizer that is not intended for them. Of course these paths or borders should be kept reasonably free from grass and weeds, which would otherwise feed upon the fertilizers intended for the plants in the plots. Having divided up the plots as indicated and marked them by numbers from 1 to 6 inclusive, prepare the soil thoroughly in the usual way, after applying the fertilizers broadcast as follows:

Plot 1.	No fertilizer.	
Plot 2.	Nitrate of soda................	20 lbs.
	Acid phosphate................	60 "
Plot 3.	Nitrate of soda................	20 "
	Muriate of potash.............	16 "
Plot 4.	Acid phosphate................	60 "
	Muriate of potash.............	16 "
Plot 5.	Nitrate of soda................	20 "
	Acid phosphate................	60 "

Muriate of potash.............16 lbs.

Plot 6. No fertilizer.

The acid phosphate in these experiments should contain not less than 8 to 10% of available phosphoric acid. If cotton is to be used in the experiment, use kainit in the place of muriate potash, taking 48 lbs. If legumes, such as clover, peas, beans or vetch, are to be used, cut the amount of nitrate of soda one-half. It is recommended that that crop be used in the experiments which is to be grown in the field the following season, in order that the results of the experiment may be directly applicable. In planting care should be taken to have the plants uniformly distributed over the plots, and as nearly as possible the same number of plants in each plot. The plots should be treated alike in all respects as to the time and manner of cultivation, and in passing from one plot to another, extreme care should be taken not to mingle the soil from one with that of another. This last caution is particularly applicable, when the plow is used in the cultivation. The harvest from each plot should be accurately weighed and the weights recorded. The importance of keeping a full and accurate record for each plot--the kind and amount of fertilizer used, the system of cultivation, and the harvest yield—cannot be too strongly urged. It will be observed that plots 1 and 6 have no fertilizer. These are check plots and are designed to show what the unfertilized soil can do. They will be especially useful in comparatively new soil or in soil that has been previously fertilized, but they should in no case be omitted.

If these experiments have been properly conducted, reasonable inferences may be drawn from a study of the results as to the fertilizer needs of the soil. Too much importance cannot be attached to the conscientious carrying out of every detail. The experiments should be under the personal direction of the farmer himself, and where any part of the labor must be done by another, the most intelligent and reliable laborer should be selected for that purpose.

It is realized that but few farmers are likely to be induced to undertake these experiments, and in the absence of other means of determining the specific needs of the soil, most farmers must assume that all the constituents are needed and must supply them in such amount and in such form as the general considerations of the soil, season and crop may seem to require. So varied are these conditions that it would be impossible to give specific instructions as to methods of fertilization. A few general principles, however, as to the needs of special crops may be stated, which, it is hoped, will serve a useful purpose.

Cotton is a crop that responds promptly and profitably to judicious fertilization, and experience teaches that concentrated complete fertilizers should be used. The profit from manuring with concentrated fertilizers is greatly enhanced by properly preparing the soil in advance. It is profitable to bring the soil into a state of good "tilth" by proper cultivation, and particularly by incorporating into it liberal quantities of organic matter. This may be done by turning under leguminous crops (like the cowpea) or barnyard manure before planting. The complete fertilizer, applied in the drill, should contain a liberal amount of "available phosphoric acid." Any of the soluble salts of potash are good, though kainit is preferred, as it is believed to be useful in preventing "blight." Of nitrogen compounds the organic forms (cotton seed meal, dried blood, tankage, &c.,) are deemed to be best suited for cotton, though nitrate of soda is excellent, especially in soils rich in organic matter. The proper proportions of available phosphoric acid, potash and nitrogen in a complete fertilizer for cotton cannot be said to have been determined with accuracy. As a result of numerous experiments at several of the agricultural experiment stations, 600 to 700 lbs. per acre of a fertilizer running 9% available phosphoric acid, 3% potash and 3% nitrogen is to be recommended.

For cereals and grasses nitrogen has been considered the dominant constituent. This arises from the fact that a top dressing of nitrate of soda at the season when there is a rapid development of stem and leaf, results in a largely increased crop. This occurs, however, only in soils which have a plentiful supply of the mineral constituents, phosphoric acid and potash. It is recommended, therefore, to use at the time of sowing a fertilizer containing a liberal amount of phosphoric acid and potash with a limited supply of nitrogen, and shortly before the maturity of the plant top dress with nitrate of soda.

The Legumes (clovers, peas, beans, vetches, &c.) are crops that do not depend solely on the soil for their nitrogen, but which, under favorable conditions, have the power of drawing at least a part of their nitrogen supply from the atmosphere. To this fact is due their superior excellence as soil renovators, since their growth upon a soil must result in its enrichment in the most costly of the fertilizer constituents, nitrogen. In fertilizing legumes, then, provide a liberal supply of the mineral constituents and a minimum of nitrogen. They seem to require potash in great abundance, Lime, also, is needed to correct a tendency to acidity in the soil which is hurtful to the growth of the bacteria so essential in order that the plant may acquire its nitrogen from the atmosphere. 25 bushels of stone lime per acre, every 4 or 5 years, is recommended for average soils which are used for the frequent growth of legumes.

Root and Tuber Crops require an abundance of all the fertilizing constituents in readily available forms, but they differ widely as to their special needs. In one group may be placed *beets, carrots and mangels*. They require a liberal supply of readily soluble phosphoric acid and nitrogen, and in light, sandy soils the addition of a little potash is advisable. In clay soils they seem to be able to get most of the potash they require from the soil. *Turnips* respond most liberally to applications of available phosphoric acid, while they seem able to extract this constituent from sources not readily accessible to other plants. A liberal supply of nitrogen, also, especially during early growth, is desirable. While the turnip is a voracious feeder on potash compounds, it seems able to obtain this constituent from the natural soil supply, though it should not be required to depend solely on this supply. *Potatoes*, both irish and sweet, require a large amount of potash, which should be in the form of sulphate rather than of muriate. The nitrogen may be mostly in organic forms, though the nitrate of soda or sulphate of ammonia is recommended for the early irish potato. The phosphoric acid in moderate amount should be available.

Fruit Crops differ from the others that we have considered in that they are produced by perennial plants instead of by annuals, and hence they require a different sort of fertilization. As the plants grow slowly, fertilizing materials which give up their constituents slowly are better, perhaps, than those whose constituents are more readily available. Fertilizers of the latter class, however, may supplement those of the former with advantage at such times as there is a rapid devel opment of leaf and fruit. Perhaps the best fertilizer for fruit trees is a mixture of ground bone 3 parts and muriate of potash two parts. An excess of nitrogen must be avoided, as this causes a too rapid growth of both wood and fruit, the latter ripening poorly under such conditions. All fertilizers for fruit crops should be worked well into the soil.

CALCULATION OF COMMERCIAL VALUES OF FERTILIZERS.

The schedule of valuations in force this season is as follows:

Nitrogen........................	14	cents per pound.
Water soluble phosphoric acid.....	5	" " "
Citrate soluble..................	5	" " "
Potash.........................	5	" " "

To compute the commercial value of fertilizers according to this scale, the valuation per ton of water soluble and citrate soluble phosphoric acid and potash is obtained by multiplying the per cent of those constituents by $1 00, while the value of the nitrogen per ton is ascertained by multiplying the per cent. of that element by $2.80.

Take for example a fertilizer containing

7.50 per cent. of water soluble phosphoric acid.
2.00 " " " citrate soluble " "
1.25 " " " potash.
2.50 " " " nitrogen.

the commercial value per ton would be:

For the water soluble phosphoric acid	7.50x1.00–$7.50
" " citrate soluble " "	2.00x1.00 $2.00
" " potash	2.00x1.00–$2.00
" " nitrogen	2.50x2.80–$7.00
Total	$17,75

Analyses Reported by the State Chemist from July 1, 1900, to July 1, 1901.

Acid Phosphates with Nitrogen and Potash.

Station No.	Name of Sample.	By Whom Sent.	Phosphoric Acid. Water Soluble.	Phosphoric Acid. Citrate Soluble.	Phosphoric Acid. Acid Soluble.	Nitrogen.	Potash.	Commercial Value.
6206	Alabama Phosphate (So called).....	N. M. Rhodes M. & M. Co.. Shell, Ala..	5.90	5.13	2.42	1.56	1.15	$16.55
6201	Alabama Fertilizer.............	" " " " " "	6.90	2.35	1.80	1.96	2.76	17.50
6208	Dale County Standard Guano......	Ozark C. S. O. M. & F. Co , Ozark, Ala	8.75	3.17	1.08	1.64	3.25	19.76
6209	Ozark H. G. Guano.........	" " " " " " "	9.65	2.53	1.20	1.22	2.95	18.55
6210	Guano No. 3	" " " " " " "	9.70	2.39	1.26	1.24	2.52	18.08
6224	B'ham Dis. Bone Am. and Potash...	Birmingham Fert. Co., Birmingham, Ala.	10.00	3.38	.37	.99	1.05	17.20
6225	B'ham H. G. Blood, Bone & Potash.	" " " " "	10.23	3.35	.37	1.87	2.22	21.04
6229	Dale Co. Standard Guano..........	Ozark C. S. O M. & F. Co., Ozark, Ala..	6.35	4.48	.50	2.36	4.11	21.55
6230	No. 2 Ozark Guano.	" " " " " " "	7.45	3.78	.91	1.32	7.84	22.77
6231	Hemes Special Guano No. 1........	Helm Bone Fert. Co., Birmingham, Ala.	0.00	5.49	6.16	1.80	2.29	12.82

Analyses Reported by the State Chemist from July 1, 1900, to July 1, 1901.

Acid Phosphates with Nitrogen and Potash

Station No.	Name of Sample.	By Whom Sent.	Phosphoric Acid. Water Soluble.	Citrate Soluble.	Acid Soluble.	Nitrogen.	Potash.	Commercial Value.
6232	Helm's Special Guano No. 2	Helm Bone Fert. Co., Birmingham, Ala	0.00	4.61	5.44	1.65	2.00	$11.23
6238	Farmers' Alliance Guano	Troy Fertilizer Co., Troy, Ala	7.15	3.25	2.65	2.02	2.32	18.38
6239	Big Hit Guano	" " " " "	6.50	3.38	3.32	1.38	1.53	15.27
6240	Blood and Bone Guano	" " " " "	8.05	3.23	2.42	1.64	2.28	18.17
6241	Hume's Am. Dis. Bone	" " " " "	8.25	2.41	2.5[illegible]	1.60	2.32	17.46
6242	Meal Mixture	" " " " "	7.05	2.73	2.2[illegible]	1.84	2.18	17.11
6243	Nancy Hanks	" " " " "	7.40	2.84	2.36	2.02	2.57	18.47
6244	Old Homestead	" " " " "	6.55	3.16	3.74	1.16	1.53	14.49
6245	Pike's Pride Guano	" " " " "	8.00	3.25	2.40	1.66	2.00	17.90
6246	Troy Perfect Guano	" " " " "	6.95	2.91	2.04	1.96	2.32	17.67

6247	Soluble Blood and Bone	Troy Fertilizer Co., Troy. Ala	7.10	2.48	3.52	1.26	1.66	14.77
6248	Blood and Bone Guano	" " " " "	8.25	2.85	2.20	1.60	2.00	17.58
6249	Dundee Guano	" " " " "	6.75	2.86	3.34	1.18	1.68	14.59
6254	Fertilizer	Cliff Foy & Bros., Abbeville, Ala	8.55	2.95	.90	2 08	1.66	18.98
6257	Jones Special Formula	Hilton, Bentley & Cosby, Brantley, Ala.	7.35	2.45	3.09	1.10	3.70	16.58
6259	Gray's H. G. Guano	—— Gray. Dadeville, Ala	9.50	2.16	.44	1.50	2.34	18.20
6369	Birmingham Dis. Bone and Potash	B'ham. Fert. Co., Birmingham, Ala	9.90	3.78	.42	.99	1.34	17.79
6270	B'ham H. G. Blood, Bone & Potash	" " " " "	10.35	3.63	.32	1.84	2.52	21.65
6271	Birmingham Soluble Guano	" " " " "	9.80	4.48	.42	1.90	1.31	20.91
6272	Birmingham Standard Grade Fert.	" " " " "	9.75	4.25	.40	1.80	1.18	20.22
6275	Guano	G. W. McKing, Five Points, Ala	5.75	1.68	3.22	1.74	1.97	14.27
6278	Guano	W. L. Patterson, Oswichee, Ala	8.45	2.50	.70	1.98	1.57	18.06
6279	Fertilizer	W. L. Cosby, Walnut Hill, Ala	7.80	2.42	.28	1.40	2.72	16.86
6282	Patapsco Guano	O. J. Belcher, Headland, Ala	8.75	2.93	1.82	.94	1.00	15.31
6291	Grays H. G. Guano	Dadeville Oil Mill, Dadeville, Ala	7.70	2.78	.22	1.56	1.79	16.64
6292	Stone & Johnston's H. G. Guano	" " " " "	7.90	2.79	.26	1.58	1.92	17.03
6293	Home Mixture Guano	" " " " "	7.80	1.91	.44	1.50	2 20	16.11
6297	Guano	S. M. Day, Five Points, Ala	6.60	5.00	6.60	1.46	.75	16.14

Analyses Reported by the State Chemist from July 1. 1900, to July 1. 1901.

Acid Phosphates with Nitrogen and Potash—Continued

Station No.	Name of Fertilizer.	By Whom Sent.	Phosphoric Acid. Water Soluble.	Phosphoric Acid. Citrate Soluble.	Phosphoric Acid. Acid Soluble.	Nitrogen.	Potash.	Commercial Value.
6298	Goldsmith's Improved Mixture.	Prim & Kimbel, Jackson, Ala	8 60	3.12	2.68	2.00	2 73	20.05
6303	Aurora	Herren & Oliver, Dadeville, "	9.00	3 20	2 25	1.66	1.19	18.04
6304	A. A. P.	" " " "	9 30	4.13	2 32	1 00	1.45	17.68
6305	Coweta H. G. Guano	" " " "	9.20	2.35	2 60	1 80	2.29	18 88
6306	W. O. C	" " " "	8 45	3.48	3.32	1 80	2 35	19.32
6313	Blood, Bone and Potash	McGhee, Driver & Co., Lafayette, Ala	5 65	5.21	4.14	1 60	1 24	16 58
6314	Mastodon	" " " " "	8.70	2.44	1.36	1.44	2.18	17.35
6317	H. G. Potash Guano	R. A. Russell & Co., Gaylesville, "	6.00	3.92	2.18	1.34	2.07	15.74
6318	Blood and Bone Guano	" " " " "	7.00	4.39	2.06	1.16	1.07	15.71
6325	Capital City Standard Guano	Wright, Henderson & Co., Elba, "	6.05	4.07	4.08	1.64	2.32	17.03

6326	Troy Perfect	Wright, Henderson & Co., Elba,	"	6.85	2.59	3.06	2.20	2.97	16 57
6327	Georgia State Grange Guano	" " " "	"	5.05	3.85	2.30	1.38	2.17	14 93
6331	Georgia State Standard	Sanders & Son, Columbia,	"	5.75	3.45	4.00	1.86	2.00	16 41
6334	B'ham H. G. Blood, Bone and Potash	Lester & Co., Columbiana,	"	8.50	4.06	1.94	1.34	1.53	17 84
6337	Blood and Bone	H. M. Beach & Son, Columbia,	"	5.80	4.02	2.08	1.61	1.87	16 20
6338	Comple Cotton Fertilizer	" " " "	"	8.65	1.71	2.24	1.80	2.38	17 78
6339	Jones' Formula	" " " "	"	8.85	3.52	1.98	1.04	3.48	18 76
6340	Excelsior	" " " "	"	8 00	2.10	1.30	1.68	1.59	16 39
6341	Farmer's Special	" " " "	"	6.70	5.74	1.46	1.11	4.82	20 37
6342	Helmet	" " " "	"	3 20	5.69	3.36	1.90	2.42	16 63
6345	Ox Cotton Guano	T. C. Masterson, Avoca,	"	8.70	4.39	1.26	1.70	1.55	19 40
6347	Armour's 271	C. A. Steifelmeyer, Hanceville,	"	2.85	7.61	1 34	1.94	1.65	17 54
6348	Meridian Blood and Bone	" " "	"	8.55	3.38	1.92	1.74	1.59	18 39
6350	Early Bird	Reynolds Bros., Jemison,	"	8.10	3.75	6.20	1.24	1.64	16 96
6353	Georgia Formula Guano	Campbell & Wright, Jr., Roanoke,	"	8.85	2.40	2.60	1.72	2.24	18 31
6354	Georgia State Grange Guano	" " " "	"	7.90	2.16	.94	1.65	3.33	18 01
6355	Pon Pon Crop Grower	" " " "	"	8.50	2.04	2.56	1.22	2.94	16 90
6356	Randolph Guano	" " " "	"	5.50	2.58	1 92	2.54	2.29	17 48

Analyses Reported by the State Chemist from July 1, 1900, to July 1, 1901.

Acid Phosphates with Nitrogen and Potash—Continued.

Station No.	Name of Fertilizer.	By Whom Sent.	Phosphoric Acid. Water Soluble.	Phosphoric Acid. Citrate Soluble.	Phosphoric Acid. Acid Soluble.	Nitrogen.	Potash.	Commercial Value.
6257	Roanoke Guano	Campbell & Wright, Jr., Roanoke, Ala.	7.25	2.45	2.70	1.98	1.41	$16 65
6367	B'ham Blood, Bone and Potash	S. E. Stewart, Hartselle, Ala	7.50	2.80	3.40	1.50	1.76	16 26
6338	Alabama Guano	" " " "	7.30	2.81	2.04	1.98	2.06	17 71
6369	Adair's Am. Dis. Bone	" " " "	7 00	1.64	2.86	1.88	2.38	16 28
6370	Ga. State Grange Fertilizer	" " " "	8.10	1.73	3.02	1.54	2.85	16 99
6371	Ox Cotton Guano	" " " "	8.95	3.84	1.86	1 56	1.74	18 90
6373	Read's H. G. Am. Dis. Bone	" " " "	8.40	3.97	1.48	.72	2.90	17 29
6374	Sample No. 1	C. R. Maxwell, Northport, "	8.75	.90	.40	1.22	2 30	15 37
6375	Sample No. 2	" " " "	10.00	1.44	.36	1.16	2.76	17 45
6377	Helmet Brand Potato Fertilizer	S. F. Alston, Tuscaloosa, Ala	2.30	9.46	2.24	3.72	4.22	26 40

6378	Helmet Brand Blood, Bone & Pot'h.	S. F. Alston, Tuscaloosa, Ala.	2.25	9.18	1.62	4.18	10.40	33 53
6379	Helmet Brand 271	" " " "	1.85	8.11	1.14	2.14	1.74	17 69
6380	Helmet Brand 386	" " " "	3.30	8 64	2 06	2.50	7.55	26 49
6383	King Cotton Grower.	W. D. Hamilton, Guin, Ala.	6 75	4.19	5.26	.60	1.29	13 91
6385	Scott's Gossypium Phospho.	C. A. Steifelmeyer, Cullman, Ala.	9.90	1.71	1.24	1.88	3.26	20 13
6387	B'ham Blood, Bone and Potash.	" " " "	8 40	3.81	1 64	1.45	2.13	18 40
6389	Bone Compound	" " " "	7.25	2.90	6.20	1.60	2.07	16.70
6390	Standard Home Mixture.	" " " "	7.45	3 82	1.08	1.62	2.90	18 71
6391	Helmet Brand 271	" " " "	2.00	7.73	1.52	2.12	2.09	17 76
6394	Ga. State Standard Superphosphate.	Law & Davis, Lincoln. Ala.	6.25	3.91	2.44	1.68	3.32	18 18
6395	Scott's Gossypium Phospho.	" " " "	7.40	4.79	.96	1.86	3.20	20.60
6396	Scott's Blood Formula.	" " " "	7.15	4 37	2.08	1.10	2.25	16 85
6399	W. O. C.	S. F. Teague, Birmingham, Ala.	6.30	2.98	3.32	1.58	2.64	17 34
6400	Teague's Beef, Blood and Bone.	" " " "	6.55	3.53	4.02	1.04	2.07	15 06
6402	Animal Ammoniated	T. H. & A. B. Stephens, Seaborn, Ala.	7.05	2.87	2.68	1.74	1.68	16 47
6403	Blood Formula.	" " " " "	9.45	3.13	2.12	1.08	1.86	17 46
6405	B'ham H. G. Fertilizer.	F. Ogden & Son, Sulligent, Ala.	8.35	3.98	.72	1.54	2.78	19 42
6406	Mobile Standard Guano.	" " " "	5.50	3.97	6.08	1.89	3.42	18 15

Analyses Reported by the State Chemist from July 1, 1900, to July 1, 1901.

Acid Phosphates with Nitrogen and Potash.

Station No.	Name of Sample.	By Whom Sent.	Phosphoric Acid. Water Soluble.	Phosphoric Acid. Citrate Soluble.	Phosphoric Acid. Acid Soluble.	Nitrogen	Potash.	Commercial Value.
6408	Ox Cotton Guano	Porter & Foster, Town Creek, Ala.	7.85	4 17	1.88	1.72	2.51	$19 35
6410	Blood & Bone	J. B. Gray & W. W. Gulledge, Ohatchie.	7.10	2.86	3.44	1.19	1.99	15 28
6412	Read's Blood & Bone No. 1	T. R. Parish & Bros., Clayton, Ala.	7.25	3 93	1.42	1.30	2.53	17 35
6415	Aurora Am. Phosphate	Jas. E. Snead, Snead, Ala.	5.85	3.32	1.38	1.64	1.93	15 66
6416	Animal Bone Fertilizer.	" " " "	7.20	4.00	6.10	1.75	1.78	17 88
6419	A. A. P. Bone with Ammonia	" " " "	7.35	4.51	1.14	1.35	1.46	17 10
6420	W. O. C. Guano	" " " "	8.30	4.47	1.48	2.22	2.62	21 61
6421	Sea Bird Guano	" " " "	7.90	2.93	6 82	1 64	2.22	17 64
6422	Coweta H. G. Fertilizer	" " " "	8.30	5.53	5.44	1.72	1.95	20 58
6424	Sea Gull Compound	R. W. Allen & Co., LaFayette, Ala.	8.00	2.75	2.30	1.00	2.34	15 89

6425	Georgia Formula	R. W. Allen & Co., LaFayette, Ala	7.70	3.07	2.18	1.44	2.40	17.20
6428	Am. Dis. Bone	J. R. G. Howell, Dothan, Ala	7.70	5.41	1.54	.98	2.99	18.84
6429	Howell's Fruit Food	" " " "	4.25	3.38	.82	3.16	3.31	19.79
6431	Beef, Blood & Bone Guano	Weathers, Swan & Co , Roanoke, Ala	7.90	3.45	1.80	1.12	1.23	15.72
6432	Solid South Guano	" " " " "	7.90	3.30	3.00	1.58	2.24	17.86
6434	Tuskaloosa Guano	Tuscaloosa C. S. Oil Co., Tuscaloosa, Ala	8.30	3.54	.26	2.16	2 36	20.25
6436	Goulding's Bone Compound	Hughes Bros., Florala, Ala	6.90	4.08	5.32	1.48	2.05	17.17
6438	Potapsco Guano	R. W. Allen & Co., LaFayette, Ala	8.55	2.89	1.96	1.36	2.32	17.57
6445	Hume's Am. Dis. Bone	Troy Fertilizer Co., Troy, Ala	8.45	3.13	2.42	1.68	2.32	18.60
6447	Troy Perfect Guano	" " " " "	7.80	3.32	2.68	1.48	2.11	17.37
6448	Blood and Bone Guano	" " " " "	8.05	3.63	2.32	1.62	2.34	18.56
6449	" " "	" " " " "	8.55	2.77	2.18	1.64	2.57	18.48
6453	Complete Cotton Fertilizer	P. J. Ham & Son, Elba, Ala	7.85	1.88	3.22	2.00	2.4[illegible]	17.70
6454	Jones Special Formula	" " " "	8.85	2.65	1.50	1 22	4.02	18.54
6455	Merriman's Cotton Boll Guano	" " " "	9.95	1.38	2.32	1.58	4.07	19.82
6456	" " " "	" " " "	10.05	1.46	1.94	1.34	3.33	18.59
6459	Blood, Bone and Potash	Hilton, Bentley & Cosby, Brantley, Ala.	10.00	2.53	1.72	.94	1.69	16.85
6460	Ga State Grange Fertilizer	" " " " "	6.10	2.84	2.56	1.68	2.93	16.57

Analyses Reported by the State Chemist from July 1, 1900, to July 1, 1901.

Acid Phosphates with Nitrogen and Potash.

Station No.	Name of Sample.	By Whom Sent.	Phosphoric Acid. Water Soluble.	Citrate Soluble.	Acid Soluble.	Nitrogen.	Potash.	Commercial Value.
6461	Jones Special Formula	Hilton. Bentley & Cosby. Bentley, Ala.	7.40	3.25	3.10	.95	3.88	17.19
6462	Sample No. 1	C. Kimbrough, Alexander City, Ala	8.20	3.36	1.94	2.06	2.88	20.21
6463	Sample No. 2	" " "	7.05	3.12	1.38	2.43	1.53	18.50
6468	Troy Perfect Guano	J. T. Ramage, Brundidge, Ala.	7.55	2.79	3.26	1.94	2.65	18.42
6469	Star Guano.	" " "	6.75	3.53	5.22	2.28	1.55	18.21
6470	Sea Gull Guano	" " "	7.00	5.25	4.10	1.84	2.68	20.08
6472	Blood Bone and Potash	W. F. Kenzie, Greenville, Ala	6.00	4.93	5.22	1.98	2.13	18.60
6473	Goulding's Special Compound	" " "	7.05	3.07	7.08	1.56	2.90	17.39
6476	Alabama Guano	J. C. Akin & Son, Notasulga, Ala.	7.10	3.77	1.28	2.16	2.36	19.28
6478	Ammo. Superposphate	First Bank of Elba, Elba, Ala.	5.55	3.56	2.80	1.42	2.43	15.41

6479	Hume's Am. Dis. Bone	First Bank of Elba, Elba, Ala	7.85	2.31	4.41	1.24	2.02	15 65
6481	Patapsco Guano	T. K. Brantley & Son, Troy, Ala	8.00	3.14	1.96	.94	2.50	16 27
6482	Sea Gull Guano	" " " "	9.45	1.23	2.12	.98	2.53	15 95
6485	Baltimore Soluble Bone	J. G & John Sanders, Dothan, Ala	8.30	3.89	1.46	.51	1.57	13 76
6493	Georgia Formula	C. H. Butler, Childersburg, Ala	7.55	2.44	2.26	1.41	2.62	16 56
6495	Georgia State Grange	Burks & Coston, Brantley, Ala	7.20	2.47	.98	2.30	2.78	18 89
6497	Ox Cotton Grower	M. F. Patterson, Falkville, Ala	7.30	3.95	2.50	2.16	2.02	19 32
6498	Troy Perfect	Burks & Coston, Brantley, Ala	7.70	2.07	2.28	1.62	2.29	16 60
6499	Blood and Bone	" " " "	4.80	4 22	4.28	1.38	1.83	14 71
6502	Perfection Guano	McMillan & Harrison, Mobile, Ala	7.80	3.06	.74	2.64	3.57	21 82
6503	" "	Jess Jackson, Grand Bay, Ala	10.55	2.56	1.34	1.48	3.34	20 59
6505	Gossypium Phospho	W. S. Crass, Pelham, Ala	9.30	2.37	.78	1.54	2.71	18 69
6508	Big Hit	G. A. Sanders, Luverne, Ala	11.35	1.68	2.02	1.22	1.06	17 51
6509	Hume's Am. Dis. Bone	" " "	7.85	1.58	3.42	1.68	2.34	16 47
6513	Roanoke Guano	A. J. Pittman, Wehodkee, Ala	7.35	2.67	3.08	1.86	2.24	17 47
6514	Randolph Guano	" " "	7.30	3.60	2 80	1.83	2.14	18 16
6516	Beef, Blood and Bone	W. A. Gage & Co., Town Creek, Ala	8.65	4.15	1.30	1.80	2.21	19 05
6517	Helmet 282	" " " " "	2.90	8.92	.98	2 00	3.25	20 62

Analyses Reported by State Chemist from July 1, 1900, to July 1, 1901.

Acid Phosphates with Nitrogen and Potash.

Station No.	Name of Sample.	By Whom Sent.	Phosphoric Acid. Water Soluble.	Phosphoric Acid. Citrate Soluble.	Phosphoric Acid. Acid Soluble.	Nitrogen.	Potash.	Commercial Value.
6518	Helmet, 271	W. A. Gage & Co., Towne Creek, Ala	2.50	9.10	1.00	2.14	2.42	$20 01
6521	Old Dominion	Phillips Bros, Oxford, Ala	4.05	4.60	2 20	1.92	3.24	17 27
6522	Talladega Am. Dis. Bone	" " " "	6.65	3.00	0.20	2.06	3.38	18 80
6524	Ga. State Standard Guano	Ingram & Co., Anniston, Ala	8.65	2.71	1 44	1.56	2.13	17 96
6527	Eddystone Soluble Guano	J. Markentepe, Cullman, Ala	6.75	4.24	2.66	2.10	1.80	17 67
6528	Fertilizer	Robbins & McGowan, Brewton, Ala	8.95	2.05	2.80	2.18	2.36	19 46
6532	Schuessler & Co's Beef, Blood & Bone	Schuessler & Co., Roanoke, Ala	7.25	3.41	6.24	1.26	1.52	15 71
6533	" " Special Formula	" " " "	7.45	3.34	4.46	1.26	4.25	18 57
6534	" H. G. Fertilizer	" " " "	6.75	3.35	4.90	1.90	2.65	18 07
6538	Ala. Fertilizer	Britt & Johnson, Wetumpka, Ala	8.60	4.99	.56	2.10	2.60	22.07

6541	Hume's Am. Dis. Bone	McEntyre, Henderson & Adams, Ozark	7.30	2.95	2.20	1.92	2.80	18.43
6543	Troy Perfect Guano	" " " "	6.70	2.34	3.66	1.26	3.28	15.85
6544	Goldsmith's Improved Mixture	" " " "	6.15	3.65	2.10	1.67	1.96	16.44
6545	Swift's Eagle	" " " "	7.10	4.93	1.02	2.02	2.87	20.56
6547	Am. Dis. Bone	B. Bullard, Elba, Ala	6.60	5.99	4.96	1.16	1.20	17.04
65·8	Crescent Guano	" " "	6.50	9.08	0.62	1.62	1.01	21.13
6550	XXX Blood & Bone Guano	George Kroell, Montevallo, Ala	8.00	3.66	2.24	1.54	1.60	17.57
5552	Farmers Alliance Guano	H. R. & H., Brantley, Ala	7.40	2.89	3.26	1.84	2.29	17.78
6553	Nancy Hanks Guano	" " " "	7.60	2.17	2.18	1.82	2.51	17.38
6554	Hume's Am. Dis. Bone	" " " "	7.20	2.39	2.46	2.10	2.81	18.28
6555	Troy Perfect	" " " "	7.90	2.67	3.08	1.94	2.12	18.12
6556	B. D. Sea Fowl Guano	" " " "	8.40	2.98	2.32	2.04	1.35	18.44
6557	Capital City Guano	" " " "	6.80	3.76	4.44	1.82	2.57	18.23
6461	B'ham Blood, Bone and Potash	Geo. M. Truss & Co., Springville, Ala	9.70	3.65	1.30	1.66	2.30	20.30
6563	Fertilizer	J. O. Hodges, Ashville, Ala	8.10	3.52	1.98	1.68	2.85	19.17
6565	Bear Beef, Blood and Bone	A. P. Howison, Randolph, Ala	7.60	4.58	2.02	2.28	2.47	21.03
6570	Ox Slaughter House Bone	W. W. Carlisle & Bro., Roanoke, Ala	7.40	4.52	1.18	1.56	2.77	19.06
6573	Blood and Bone Guano	" " " " "	4.60	5.13	1.42	1.70	2.75	17.24

Analyses Reported by State Chemist from July 1, 1900 to July 1, 1901.

Acid Phosphates with Nitrogen and Potash—Continued.

Station No.	Name of Sample.	By Whom Sent.	Phosphoric Acid. Water Soluble.	Phosphoric Acid. Citrate Soluble.	Phosphoric Acid. Acid Soluble.	Nitrogen.	Potash.	Commercial Value.
6574	Roanoke Guano	W. W. Carlisle & Bro. Roanoke, Ala	5.55	4.44	2.66	2.04	1.79	17.49
6575	Randolph Fertilizer	" " " " "	6.85	3.91	2.24	2.00	2.03	18.39
6579	Alabama Fertilizer	Sessions & Mizelle, Enterprise, Ala	6.75	5.52	1.38	1.86	1.59	19.07
6582	Helmet 271	T. A. Howle, Oxford, Ala	2.00	8.84	.60	1.98	1.67	18.05
6583	Georgia State Grange Guano	" " "	7.45	2.50	1.80	1.70	2.61	17.32
6584	Birmingham Guano	" " "	4.85	4.17	1.48	1.14	1.75	13.96
6588	Tip Top	T. J. Land, Cullman, Ala	9.65	2.83	2.32	1.02	1.27	16.61
6590	Stern's Am. Raw Bone	Chapman & Co., Geneva, Ala	4.30	3.60	4.40	1.52	1.66	16.92
6501	Champion Farmers' Choice	" " " "	6.80	3.07	88	2.14	1.64	17.50
6594	No. 3 Wet Guano	J. S. Collins, Geneva, Ala	7.35	5.24	1.86	1.44	1.70	18.32

6597	Mobile Standard	Crutcher & Ward, Cuba, Ala	5.40	5.10	6.40	1.65	2.24	17.36
6599	Helmet Brand	M. P White, Attalla, Ala.	1.45	8.97	.58	2.26	1.87	18.62
6601	Scott's Animal Am. Dis. Bone	W. J. Sibert, Gadsden, Ala	7.50	2.98	2.82	1.64	1.55	16.62
6603	Mobile Standard Guano	Chas. Ivey, Evergreen, Ala	5.65	4.60	6.10	1.72	2.11	17.18
6605	Blood and Bone	Zena Shepherd, Georgiana, Ala.	6.45	3.64	4.16	1.51	2.15	16.47
6608	Alliance Soluble Guano	J. I. Covington, Bertha, Ala	6.50	4 27	3.38	1.78	2.01	17.76
6609	Rock City	J. E. F. Westmoreland, Florence, Ala.	6.95	3.48	1.12	1.50	1.75	16.38
6610	Pacific Guano	" " " "	7.40	4.23	5.02	1.18	1.84	16.77
6611	Armour's 722	J. A. Kenney, Loop, Ala	4 05	9.47	4.28	1.48	2.22	19.88
6616	Corn and Cotton Guano	J. C. Hartselle & Son, Hartselle, Ala.	5.85	5 41	4.24	1.14	1.68	16.13
6619	King Cotton Grower	W. A. Shaw, Winfield, Ala	5.30	4.43	4.12	1.15	2.03	14.98
6621	Crescent Guano	C. R. Waxwell, Northport, Ala	6.30	3.38	4.12	1.68	1.86	16.24
6622	Maxwells' Home Mixture	" " " "	6.55	2.78	0.42	1.96	1.97	16.79
6624	Baltimore Soluble Bone	Bean & McMurray, Heflin, Ala	8.90	4.89	1.26	.55	.....	13.79
6626	Bear, Beef Blood and Bone	" " " " "	7.70	5.14	.86	1.38	2.12	18.82
6631	Ox Cotton Guano.	Franzen & Olsoo, Thorsby, Ala	8 00	4.35	2.10	1.78	1.50	18.83
6633	B'ham Dis Bone Am. and Potash	T. U. Crumpton, Maplesville, Ala	9.05	4.49	.66	.56	1.59	16 17
6634	Star Brand	S. N. Rains, Elba, Ala	6.60	4.46	5.34	2.10	1.70	18.64

Analyses Reported by State Chemist from July 1st, 1900, to July 1st, 1901.

Acid Phosphate with Potash—Continued.

Station No.	Name of Sample.	By Whom Sent.	Phosphoric Acid. Water Soluble.	Phosphoric Acid. Citrate Soluble.	Phosphoric Acid. Acid Soluble.	Nitrogen.	Potash.	Commercial value.
6635	Blood Formula	W. E Crass, Pelham, Ala	7.45	4.04	4.76	.86	1.95	$15.85
6637	Complete Fertilizer	John Ward, Headland, Ala	2.60	2.21	.84	.82	1.53	8.64
6640	Blood, Bone and Potash	Asa Griffith, Hanceville, Ala	7.95	3.00	2.30	1.54	1.74	17.00
6641	Beef, Blood and Bone	" " " "	7.95	3.98	1.22	1.88	2.06	19.25
6642	" "	" " " "	6.85	6.55	1.85	1.78	2.17	20.55
6643	Tatapsco	" " " "	9.00	3.00	2.25	1.05	1.92	16.86
6647	Meridian Blood and Bone	G. H. Amos, Duck Spring, Ala	7.55	3.10	2.00	2.00	2.30	18.55
6648	" Home Mixture	" " "	8.05	2.90	1.90	1.68	2.25	17.90
6649	Armour's 272	W. T. Andrews, Gold Hill, "	1.35	6.84	6.76	2.16	2.67	16.91
6650	Helmet 272	" " "	2.40	8.55	1.50	2.20	2.78	19.89

6651	Ox Cotton Guano	W. T. Andrews, Gold Hill, Ala.	8.90	3.05	2.05	1.82	1.76	18 81
6653	Blood, Bone and Potash	F. D. Byrum, Byrum, Ala.	8.05	4.00	1.80	.98	1.23	16 02
6654	Georgia State Grange Guano	" " "	7.90	2.50	2.20	1.78	2.70	18 08
6656	A. G. Winkler's Am. Dis. Bone	A. G. Winkler, Greenville, Ala	6.70	2.70	6 25	2.18	2.02	17 52
6658	Am. Dis. Bone	Jno. H. Wilson, Jenifer, "	8.30	2.00	0.40	1.46	2.13	16 52
6664	Mobile Standard	W. W. Burnette, Geneva, "	6.80	7.10	.90	1.84	2.34	21 39
6668	Scott's Gossypium Phospho	Lull & Lacy, Wetumpka, "	9.45	2.65	1.15	1.68	2 41	19 21
6669	" Blood Formula	" " "	8.20	3.26	1.78	1 09	1.95	16 46
6672	" AA	D. D. Hughes, Lebanon, "	7.30	5.35	2.70	1.70	1.45	18 86
6674	" Blood Formula	" " " "	6.90	9.87	1.78	.96	1.25	20 71
6677	No. 271	Cash Supply Co., Mountain Creek, Ala.	3 60	8.56	.74	2.50	2.10	21 26
6678	Alabama Fertilizer	" " " " " "	6.25	4.02	1.78	2.10	2 34	18 49
6679	Georgia Farmer	J. G. Land, Cullman, Ala.	5.05	4.05	3 00	1.56	2.12	15 59
6680	Scott's	Joel W. Ligg. Elkmont, Ala	7.00	2.95	2.80	1.76	1.59	16 47
6686	XXX Am. Dis. Bone	Trawick & Jernigar, Opelika, Ala	5.45	4.62	3.28	1.52	2.31	16 64
6687	XX Blood and Bone	" " " "	5.55	4.73	3.42	1.68	2.06	17 04
6688	Old Time Guano	" " " "	5.50	3.80	4.10	1.64	2.48	16 37
6689	Lee Fertilizer	" " " "	6.45	3.86	1.84	1.64	2 55	17 45

Analyses Reported by State Chemist from July 1st, 1900 to July 1st, 1901.

Acid Phosphate with Nitrogen and Potash—Continued.

Station No.	Name of Fertilizer.	By Whom Sent.	Phosphoric Acid. Water Soluble.	Phosphoric Acid. Citrate Soluble.	Phosphoric Acid. Acid Soluble.	Nitrogen.	Potash.	Commercial value.
6633	Alabama Fertilizer	W. D. Brown, Gravilla, Ala.	7.70	2.50	1.50	2.06	2.04	18 01
6694	Mobile Standard Guano	" " "	3.85	5.25	6.25	1.92	1.93	16 41
6697	Eddystone Soluble Guano	Coley & Sandlin, Alex. City, Ala.	7.00	5.29	0.70	1.43	1.88	18 06
6698	Magic Cotton Grower	" " " " "	7.40	2 65	1.80	1.13	2.38	15 59
6700	Special Blood Mixture	" " " " "	5.60	4.20	1.25	.92	1 58	13 96
6703	Goulding's Bone Compound	W. D. Brown, Gravilla, Ala.	8.40	6.25	.90	1.70	.91	20 32
6706	Cahaba Dis Bone Am. & Potash	White & Spigener, Goodwater, Ala.	9.30	4.95	1.30	.78	1.32	17 75
6707	" H. G. Blood, Bone & Potash	" " " "	7.75	3.80	1.35	1.55	2 04	17 93

6709	Standard Guano	White & Spigener, Goodwater, Ala	7.00	3.18	0.60	1.38	1.63	15 64
6710	Boss Cotton Grower	" " " "	7.10	5.05	2.45	.84	1.93	16 48
6224	B'ham Dis. Bone, Am. & Potash	Birm'ham Fert Co., Birmingham, Ala	10.00	3.38	.37	.99	1.05	17 20
6225	B'ham H. G. Fertilizer	" " " " "	10.23	3 35	.37	1.87	2.22	21 04
6225	Cahaba H. G. Fertilizer	" " " " "	10.23	3.35	.37	1.87	2.22	21 04
6712	Merriman's Cotton Boll Guano	W. C. Perry, Seale, Ala	5.20	6.55	1.55	1.39	1.82	17 46
6714	Troy Perfect	Ben. Jennings, Seale, Ala	6.65	2.65	2.90	1.62	1.86	15 17
6717	Eddystone Soluble Guano	W. H. Bynum, Boaz, Ala	7 30	5.90	2.10	1.44	1.71	18 94
6719	Blood & Bone	J H. Myers, Langstone, Ala	7.25	4.15	5.70	.59	1.91	14 96
6720	Patapsco Guano	Bean & McMurry, Heflin, Ala	8.10	3.85	1.75	.82	2.76	17 01
6724	Blood, Bone & Potash	McEntire, Henderson & Adams, Ozark	5.30	5.00	5.60	1.96	1.77	17 56
6725	Eddystone Soluble Guano	Elrod & Gibson, Collinsville, Ala	6.15	5.59	3.06	1.94	1.53	18 70
6726	No. 1 Guano	W. H. Mizelle, Grimes, Ala	6.80	1.69	3.06	1.46	2.06	14 64
6727	No. 3 Guano	" " "	7.15	4.79	1.36	2.12	2.03	19 91
6730	Magnet Soluble Guano	Davis, Marshall & Co., Mobile, Ala.	6.70	4.55	1.85	2.20	2.13	19 54
6734	Beef, Blood & Bone	R. F. Gilbert, Porterville, Ala	6.65	5.43	1.22	.73	1.53	15 65
6735	Magic Cotton Grower	" " "	5.80	6.11	1.44	.90	2.01	16 54
6738	Alabama Guano	Gunter & Ealem, Gantt, Ala	6.50	3 54	3.16	1.88	1.90	17 20

Analyses Reported by State Chemist from July 1, 1900, to July 1, 1901.

Acid Phosphates with Potash.

Station No.	Name of Sample.	By Whom Sent.	Phosphoric Acid. Warter Soluble.	Phosphoric Acid. Citrate Soluble.	Phosphoric Acid. Acid Soluble.	Nitrogen.	Potash.	Commercial Value.
6739	Old Homestead	Gunter & Ealem, Gantt, Ala	8.45	3.60	3.10	1.00	2.29	$17 13
6740	Meal Mixture	" " " "	6.10	3.60	2.10	1.98	2.06	17 20
6741	Pike Pride	" " " "	7.60	3.56	1.04	1.54	2.27	17 74
6744	Cow Guano	McEntire Bros., Cullman, Ala	5.70	3.03	5.02	1.78	2.20	15 91
6745	Corn and Cotton Guano	" " " "	8.10	.83	5.72	.74	2.25	13 25
6747	Blood and Bone Guano	S. W. Henry, Springville, "	6.00	4.43	4.32	.86	2.09	14 93
6748	Fertilizer	J. C. Alford & Son, Childersburg, Ala	6.75	6.57	2.98	1.66	1.77	19 74
6751	Farmer's Special Manure	R. Q. Edmonson & Bros., Eufaula, Ala	7.45	4 90	1.10	.74	2.81	17 23
6753	282	F. L. Johnson & Co., Gadsden, Ala	2 25	7.60	2.35	2.10	2.18	17 91
6754	Complete Fertilizer	E. J. Neher, Hollywood, Ala	4.60	4.50	4.90	.80	2.13	13 74

6762	S. & K. Am. Dis. Bone	Opelika Chemical Co. Opelika, Ala	7.05	4.30	6.30	1.30	1.30	16.29
6768	Blood and Bone Guano	" " " " "	7.05	3.85	3.90	2.26	1.66	18.89
6769	Alliance Soluble	" " " " "	7.50	3.19	4.76	2.14	2.13	18.81
6770	C C. C. Standard Fertilizer	" " " " "	7.55	3.84	4.56	2.24	2.01	19.67
6771	Star Brand Guano	" " " " "	7.15	3.03	4.82	1.72	1.25	16.25
6772	Pinkard's Home Mixture	" " " " "	5.45	3.39	1.06	2.40	1.90	17.46
6773	Meal and Phosphate Compound	" " " " "	7.90	5.00	1.20	2.64	.72	21.01
6774	Good Luck Soluble Guano	" " " " "	6.95	4.23	6.62	1.28	1.18	15.94
6775	Diamond Soluble Guano	" " " " "	7.05	3.30	4.90	2.08	1.27	17 44
6776	Schuessler Bros.' H. G. Guano	" " " " "	7.45	2.82	5.08	1.98	1.31	17.12
6777	Schuessler & Co's Beef, Blood & B'ne	" " " " "	7.05	3.73	6.22	1.28	1.45	15.81
6778	" " Special Formula	" " " " "	6.55	4.10	3.80	1.38	2.14	17.65
6779	" " H. G. Fertilizer	" " " " "	7.85	3.47	4.78	2.26	2.00	19.65
6809	Sea Gull Soluble Guano	W. B. Wilhite, Hartselle, Ala	6.50	2.88	4.32	1.66	2.19	16.22
6810	Capital City Standard Fertilizer	" " "	6.20	6.03	1.02	1.60	2 29	19.00
6791	Am. Dis. Bone	Montgomery Fertilizer Co., Montgom'y.	7.00	3.96	5.54	1.24	1.51	15.94
6792	Vandiver's Am. Dis. Bone	" " " "	6 50	3.93	7.12	1.29	1.36	15.40
6793	Montg'y Blood and Bone Guano	" " " "	7.60	3.45	4.80	2.20	2.32	19 53

Analyses Reported by State Chemist from July 1, 1900 to July 1, 1901.

ACID PHOSPHATES WITH NITROGEN AND POTASH—Continued.

Station No.	Name of Sample.	By Whom Sent.	Phosphoric Acid. Water Soluble.	Phosphoric Acid. Citrate Soluble.	Phosphoric Acid. Acid Soluble.	Nitrogen.	Potash.	Commercial Value.
6794	Southern Pacific Guano...........	Montgomery Fertilizer Co., Montgom'y.	7.35	3.33	5.32	1.26	1.56	15.77
6795	Plow Brand Soluble Guano.........	" " " "	7.25	4.52	4.28	1.21	1.50	16.66
6796	Tariff Reform Soluble Guano......	" " " "	7.70	2.11	5.84	2.26	2.18	18.32
6797	Early Bird Soluble Guano.........	" " " "	7.75	3.16	5.24	1.28	1.19	15.68
6798	Our Cotton Queen Guano...... ...	" " " "	6.70	6.82	3.18	1.28	1.80	18.90
6799	Capital City Standard Guano..	" " " "	7.50	3.83	4.92	2.28	2.74	20.45
6800	Willson's Special Compound........	" " " "	8.30	3.74	3.96	1.52	1.67	17.97
6802	Planters Pride Guano..............	West & McMurray, Roanoke, Ala.......	6.95	3.27	2.98	1.55	2.11	16.67
6805	Sea Gull Soluble Guano...........	Montgomery Fertilizer Co., Montgom'y.	7.70	3.33	4 62	2.24	2.55	19 85
6806	Crescent Guano....................	" " " "	7.55	3.27	4.68	2.06	1.52	18.09

6807	Clayton Fertilizer	Montgomery Fertilizer Co., Montgom'y.	5.50	3.66	.94	2.40	3.41	19.39
6813	Am. Dis. Bone	C. W. Bell & Son, Lineville, Ala	9.20	.54	3 86	1.92	2.37	17.49
6817	Baltimore Soluble Bone	G. W. Roberts & Co., Collinsville, Ala	7.90	4.11	1.54	1.14	1.85	17.05
6818	H. G. Patapsco Guano	" " " "	9.20	3.06	1.84	1.40	1.78	17.96
6814	Blood, Bone and Potash	C. W. Bell & Son, Lineville, Ala	5.30	6.80	7.30	.08	2.01	14.33
6819	Alabama Fertilizer	W. A. Arnold, Ozark, Ala	8.60	2.40	1.80	1.92	1..7	18.15
6820	Dale County Standard	" " "	8.70	3.91	.74	2.30	1.97	21.12
6822	Solid South Guano	Reeves, Sanders & Co., Heflin, Ala	6.55	3.73	2.92	1.54	1.92	16.71
6823	Am. Dis. Bone	W. F. Vandiver & Co., Montgomery, Ala.	7.15	3.87	5.08	1.43	1.74	16.78
6825	Helmet Brand 271	F. R. King & Co., Leighton, Ala	1.55	10.10	.60	2.04	1.47	18.83
6826	Alliance Soluble Guano	J. C. Pinkston, Shorter, Ala	6.60	3.64	5.06	1.76	2.01	17.02
6829	Goulding's Bone Compound	F. A. Gulledge, Verbena, Ala	6.20	4.22	4.28	1.29	2.85	16.88
6833	Patapsco Am. Dis. Bone	White & Aubry, Roanoke, Ala	7.10	3.44	2.66	1.78	2.02	17.54
6834	Patapsco H. G. Guano	" " " "	8.65	2.91	1.94	1.28	2.08	16.22
6835	Sea Bird Guano	" " " "	7.20	4.57	1.78	1.68	2.34	18.81
6836	Sea Gull Guano	" " " "	8.35	1.53	2.22	1.34	1.89	15.52
6837	W. O. C. Pure Blood Guano	" " " "	6.75	4.37	1.48	1.74	2.13	18.02
6839	Bear Beef, Blood and Bone	A. B. Vandigrift & Son, B'ham, Ala	7.70	4.78	1.62	1.68	2.67	19.85

Analyses Reported by State Chemist from July 1, 1900, to July 1, 1901.

Acid Phosphates with Nitrogen and Potash.

Station No.	Name of Sample.	By Whom Sent.	Phosphoric Acid. Water Soluble.	Phosphoric Acid. Citrate Soluble.	Phosphoric Acid. Acid Soluble.	Nitrogen.	Potash.	Commercial Value.
6840	Helms Bone, Blood and Potash No. 3	Helm Bone Fertilizer Co., B'ham, Ala.	0.00	6.09	4.36	2.12	2.78	14.81
6841	Helms Bone, Blood and Potash No. 4	" " " " " "	0.00	4.29	5.26	1.92	2.13	11.81
6843	Mobile Standard	E. H. & A. S. Murdock, Coffee Springs.	3.15	5.69	5.16	1.96	2.20	16.53
6845	Dismond Guano	Cameron Bros, Notasulga, Ala	5.70	4.66	5.34	1.90	1.33	17.01
6847	Bear Beef, Blood and Bone	T. L. Neighbors & Bros, Goodwater, Ala.	7.65	3.12	1.88	2.10	2.42	19.07
6848	Champion Farmers' Choice	R. S. Pilley, Georgiana, Ala	6.70	3.85	3.90	1.86	2.20	17.96
6851	Complete Fertilizer	F. E. Oliver, Hyatt, Alabama	0.00	3.90	6.28	1 74	2.76	11.53
6854	Sea Foul Guano	W. J. Mullins, Clanton, Ala	7.50	3.83	1.12	1.88	1.72	18.31
6855	Alabama Fertilizer	" " " "	7.35	2.65	1.70	1.88	1.78	17.04
6857	Magic Cotton Grower	West & McMurry, Roanoke, Ala	6.90	3.58	1.72	0.90	1.28	14.28

6860	No. 3. Eddystone Solublo Guano...	Montgomery Bros., Lincoln, Ala......	6.30	3.94	.96	2.60	1.83	19.35
6862	Bear, Beef, Blood and Bone.........	J. T. Tabor, Keener, Ala......	7.70	4.47	.88	2.04	1.74	19.62
6867	Scott's Gossypium Guano	Haley Bros., Haleyville, Ala...........	9.05	2.60	2.40	1.92	2.84	19.87
6868	Scott's Blood Formula	" " " "	9.50	3.97	1.48	1.02	1.42	17.75
6869	Bear Guano..........................	" " " "	8.45	4.35	2.70	2.00	2.13	20.53
6870	Florence King Cotton Guano......	" " " "	3.90	4.47	5.08	1.44	2.08	14.48
6872	Howle Bros. Bone Compound.....	Howle Bros., Wetumpka, Ala..........	6.80	3.99	6.86	1.74	1.84	17.50
6874	Ozark Guano No. 2................	Ozark C. S. O. M. and Fert. Co., Ozark.	6.75	5.99	1.26	2.30	1.63	20.81
9876	Blood, Bone and Potash Guano....	E. P. Duncan, Alexander City, Ala ...	5.60	5.64	4.76	1.84	1.20	17.59
6877	Georgia State Grange....	" " " " "	5.35	3.40	1.80	1.10	3.48	15.31
6879	New Brand No. 721................	J. H. Henderson, Cross Keys, Ala......	4.65	6.49	9.36	1.82	1.04	14.00
6880	Am. Bone	S. J. Baird, Guin, Ala..................	9.85	7.11	5.24	0.11	.43	17.70
6882	King Cotton Grower...............	J. H. Karter Co., Cullman, Ala.........	4.80	5.80	5.50	.84	1.42	14.37
6883	Bear Guano..........................	" " " " "	11.40	5.88	1.22	.04	0.00	17.28
6885	Soluble Guano......................	T. H. McEntyre, Coffee Springs, Ala. ..	2.25	7.95	7.50	1.21	1.20	14.79
6889	Eagle Am. Bone....................	L. O. Cox, Boaz, Ala..................	6.65	4 25	2.70	1.72	2.32	18.04
6890	Eagle Guano........................	L. O. Cox, Boaz, Ala..................	8.10	4.15	2.60	1.90	1.97	19.54
6891	Helmet Brant No. 271..............	J. H. Henderson, Cross Keys, Ala......	1.90	8.02	.98	2.02	1.80	17.38

Analyses Reported by State Chemist from July 1st, 1900 to July 1st, 1901.

ACID PHOSPHATE WITH NITROGEN AND POTASH—Concluded.

Station No.	Name of Fertilizer.	By Whom Sent.	Phosphoric Acid. Water Soluble.	Phosphoric Acid. Citrate Soluble.	Phosphoric Acid. Acid Soluble.	Nitrogen.	Potash.	Commercial value.
6892	Helmet Brand No. 272	J. H. Henderson, Cross Keys, Ala.	2.70	7.88	1.02	2.38	2.31	$19.55
6893	" " " 285	" " " "	2.00	8.07	2.48	2.00	5.46	24.13
6894	African Cotton Grower 292	" " " "	2.75	11.09	1.36	2.90	2.92	24.88
6896	Eddystone	M. Noble, Avery, Ala.	7.30	4.58	1.72	1.82	1.67	18.55
6898	Beef Blood and Bone	Reeves, Landers & Co, Heflin, Ala	7.20	4.27	1.98	.98	1.62	15.83
6901	Old Hickory Guano	T. B. Williams, Cullman, Ala.	7.45	2.86	3.34	1.98	1.75	17.60
6902	Am. Dis. Bone Guano	" " "	8.15	4.70	5.50	.44	2.23	16.31
6903	Complete Fertilizer	J. C. Hensley, " "	5.70	3.82	4.28	1.58	2.38	16.32
6909	Coley & Sandlin's Special Guano	Tallapoosa Oil Co., Alexander City, Ala.	6.90	3.50	.50	1.48	2.04	16.58
6910	Cotton Queen Guano	" " " " " "	5.65	2.72	.78	2.10	2.35	16.60

6911	Standard Guano....................	Tallapoosa Oil Co., Alexander City, Ala.	6.60	3.16	.64	1.52	2.20	16.22
6012	Soluble Guano....................	" " " " " "	6.25	3.36	.54	2.10	2.26	17.75
6913	Waters' Special Guano.............	" " " " " "	6.40	3.10	1.00	1.52	[illegible].13	15.89
6225	Cahaba H. G. Blood, Bone & Potash	Birmingham Fertilizer Co., B'ham, Ala.	10.23	3.35	.37	1.87	2.22	21.04
6225	Earle, Terrell & Co's. H. G. Fert'r..	" " " " "	10.23	3.35	.37	1.87	2.22	21.04

Analyses Reported by State Chemist from July 1, 1900, to July 1, 1901.

Acid Phosphates with Potash.

Station No.	Name of Sample.	By Whom Sent.	Phosphoric Acid. Warter Soluble.	Phosphoric Acid. Citrate Soluble.	Phosphoric Acid. Acid Soluble.	Potash.	Commercial Value.
6222	B'ham Acid Phos. & Potash Mixture	B'ham Fertilizer Co., Birmingham, Ala.	8.80	8.35	0.30	2.18	16.33
6223	B'ham Potash Bone	" " " "	7.73	4.92	.56	3.59	16.24
6237	Acid Phosphate & Potash	Troy Fertilizer Co., Troy, Ala	7.00	1.97	3.66	3.39	12.33
6250	Dis. Bone & Potash	" " " "	6.85	1.51	3.64	3.90	12.20
6265	B'ham A. P. & Muriate of Pot. Mixt.	B'ham Fertilizer Co., Birmingham, Ala.	10.40	5.03	.22	2.51	17.94
6266	" " and Potash Mixture	" " " " "	7.60	6.30	.40	2.26	16.16
6267	B'ham Bone Ash	" " " " "	9.05	4.27	.38	4.30	17.62
6268	B'ham Potash Bone	" " " " "	9.40	4.62	.38	4.13	18.15
6273	B'ham Acid Phos. and Potash	" " " " "	10.20	3.77	.48	1.41	15.38
6280	Acid Phosphate and Potash	W. Andrews, LaFayette, Ala	8.65	3.32	.58	4.41	16.38

6295	.. .. ..	W. Andrews, LaFayette, Ala	8.20	3.83	.72	4.89	16.92
6299	Coweta Dis. Bone & Potash	Herren & Oliver, Dadeville, Ala	12.45	3.43	.62	1.98	17.86
6300	.. ..	.. ..	6.95	4.98	2.12	3.13	15.06
6301	.. H. G. Dis. Bone & Potash	.. ..	11.25	3.09	.56	2.13	16.47
6302	Coweta Standard	.. ..	9.00	3.52	.58	4.28	16.80
6310	Acid Phos. & 4% Potash	McGhee, Driver & Co., LaFayette, Ala	.65	9.00	1.50	4.56	14.21
6311	Dis. Bone & Potash	.. ..	7.60	5.33	3.12	1.84	14.77
6312	Bone & Potash	.. ..	10.20	5.44	1.36	1.09	16.73
6315	Stono Acid & Potash	R. A. Russell. & Co., Gaylesville, Ala	5.15	9.36	1.14	2.49	18.00
6324	Bone & Potash Phosphate	Wright, Henderson & Co., Elba, Ala	8.75	2.36	1.54	3.39	11.51
6329	Dixie Acid Phos. & Potash	Jno. A. Nicholls, Childersburg, Ala	6.30	6.98	.52	2.41	15.69
6330	Cahaba Acid Phos. & Potash	.. ..	10.25	4.83	.52	1.26	16.34
6333	B'ham Acid Phos. & Potash Mixture	Lester & Co., Columbiana, Ala	9.45	4.45	1.00	1.01	14.91
6336	8 and 4	H. M. Beach & Son, Columbia, Ala	8.55	1.99	.86	4.87	15.41
6344	Bone & Potash	T. C. Masterson, Aorca, Ala	9.50	6.18	3.02	.24	15.92
6349	Marietta Guano Co's H. G. Dis.Bone	Reynolds Bros., Jemison, Ala	8.30	4.01	1.84	2.21	14.52
6351	Bone & Potash Acid	Campbell & Wright, Jr., Roanoke, Ala	9.60	2.01	3.44	2.17	13.78
6352	Potash Acid	.. ..	8.95	2.37	3.68	2.52	13.84

Analyses Reported by the State Chemist from July 1, 1900 to July 1, 1901.

Acid Phosphates with Potash—Continued.

Station No.	Name of Sample.	By Whom Sent.	Phosphoric Acid.			Potash.	Commercial Value.
			Water Soluble.	Citrate Soluble.	Acid Soluble.		
6382	Ashcraft's Formula	W. D. Hamilton, Guin, Ala	5.05	5.47	4.88	2.03	12 55
6398	Teague's Bone and Potash	S. F. Teague, Birmingham, Ala	6.35	6.52	3.68	2.12	19.99
6411	Read's Alkaline Bone	T. K. Parish & Bro., Clayton, Ala	6.15	4.94	1.66	2.40	13.49
6413	Imperial	V. B. Atkins & Co., Selma, Ala	11.15	3.49	.76	.72	15.36
6417	Coweta H. G. Dis. Bone and Potash	Jas. E. Snead, Snead, Ala	9.35	6.84	.66	2.63	18 82
6418	13 and 4 Dis. Bone and Potash	" " "	8.15	6.76	3.64	4.42	19.33
6423	Patapsco Acid Phosphate	R. W. Allen & Co., LaFayette, Ala	9.85	5.64	1.26	1.11	16.60
6427	Phosphate with Potash	J. R. G. Howell, Dothan, Ala	7.00	4.15	1.30	3.76	14.91
6444	Acid Phosphate and Potash	Troy Fertilizer Co., Troy, Ala	9.55	3.52	2.48	5.51	18.58
6446	Dis. Bone and Potash	" " " " "	9.40	2.85	2.60	5.98	18.23

6452	Ga B onCompound	P. J. Ham & Son. Elba, Ala.	7.95	3.09	.56	3.75	14.79
6458	Bone and Potash Acid Phosphate	Hilton, Bentley & Cosby, Brantley, Ala.	11.65	1.17	.78	2.83	15.65
6475	Opelika Phosphate and 2% Potash	J. C. Akin & Son, Notasulga, Ala.	6.25	4.91	5.14	2.05	13.21
6480	Patapsco Phosphate	T. K. Brantley & Son, Troy, Ala.	10 50	3.12	1.08	1.91	15.53
6483	" " 1% Potash	J. G. & John Sanders, Dothan, Ala	9.90	3.35	2.00	1.97	15.22
6484	Acid Phosphate with 4% Potash	" " " " "	1.80	7.49	1.26	5.86	15.15
6489	Acid Phosphate and Potash	First Bank of Elba, Elba, Ala.	7.90	3.28	2.12	3.43	14.61
6490	B'ham Dis. Bone and Potash	C. H. Butler, Childersburg, Ala.	9.30	2.76	1.74	1.08	13.14
6491	Acid Phosphate and Potash	" " " "	10.20	3.31	2.04	1.66	15.17
6492	B'ham Acid Phos. and Potash	" " " "	11.05	2.37	.68	2.32	15.74
6510	"Guano"	W. A. Sims, Elrath, Ala.	1.45	8.76	1.94	1 14	11.35
6512	Potash Acid	A. J. Pittman, Wehodkee, Ala.	8.00	4.18	1.02	2.51	14.75
6520	Dis. Bone and Potash	Phillips Bros., Oxford, Ala.	8.05	5.84	.86	3.86	17.75
6525	Tenn. Special Wheat Grower	Ingram & Co., Anniston, Ala.	1 45	10.20	1.90	6.03	17.68
6531	S. & Co's H. G. Bone and Potash	Scheussler & Co., Roanoke, Ala.	5.05	4.79	5.96	1.97	11.81
6535	Sample No. 1	W. W. Hicks & Co., Dadeville, Ala.	7.85	4.99	1.66	1.77	14.0[illegible]
6536	Bear Brand Potash Mixture	Britt & Johnson, Wetumpka, Ala.	5.80	5.25	5.60	3.49	14.54
6540	Dis. Bone and Potash	McEntyre, Henderson & Adams, Ozark.	9 00	3.47	1.68	4.08	16.55

Analyses Reported by State Chemist from July 1st, 1900, to July 1st, 1901.

Acid Phosphate with Potash—Continued.

Station No.	Name of Sample.	By Whom Sent.	Phosphoric Acid.			Potash.	Commercial value.
			Water Soluble.	Citrate Soluble.	Acid Soluble.		
6542	Dis. Bone and Potash	McEntyre, Henderson & Adams, Ozark	3.60	5.97	2.18	4.11	$13.68
6559	B'ham Acid Phos and Potash Mixture	Geo. M. Truss, Springville, Ala	10.75	6.28	.32	2.64	19 67
6560	B'ham Acid Phos with Potash	.. .. ..	12.00	3.21	.44	2.35	17.56
6571	Bone and Potash Mixture	M. W. Carlisle & Bro., Roanoke, Ala	5.55	6.04	3.56	1.77	13.36
7572	Ox Potash Mixture	.. .. ..	7.30	4.75	6.00	2.22	14.27
6577	Ac'd Phos with Potash	Sessions & Mizell, Enterprise, Ala	4.35	5.45	4.50	3 75	13.55
6578	Alkaline Bone with 2% Potash	.. .. ..	6.50	4.80	4.36	3.07	14.37
6581	Bone and Potash	T. A. Howle & Co., Oxford, Ala	8 95	4.43	.72	2.21	15.59
6607	Phosphate 2% Potash	J. I. Covington, Bertha, Ala	5.80	5.82	1.68	2.19	13.81
6613	"Complete Fertilizer"	Burns & Beaver, Lincoln, Ala	7.80	3.97	4.78	2.19	13.96

6617	Tiger Brand Guano	J. C. Hartselle & Son, Hartselle, Ala	4.85	6.12	4.78	2.48	13.45
6625	Bear Bone and Potash	Bean & McMurray, Hefln, Ala	4.45	7.00	6.90	2.12	13.57
6628	Eddystone Bone and Potash	Elsod & Gibson, Collinsville, Ala	10.15	6.32	1.98	1.56	18.03
6665	Scott's H. G. [and Potash]	Lull & Lacey, Wetumpka. Ala	6.95	5.0[illegible]	.68	2.22	14.19
6667	Pure Dis. Bone and Potash	" " "	9.80	2.80	.90	1.52	14.22
6683	No. 1 " " "	Trawick & Jernigan, Opelika, Ala	8.85	4.84	2.96	2 45	14.54
6684	No. 2 " " "	" " "	8.30	3.75	3.30	2.88	14.93
6685	No. 3 " " "	" " "	8.70	3.96	3.74	3.52	16.18
6695	Marietta H. G. Acid Phos. and Potash	Coley & Sandlin, Alexander City, Ala	6.20	4.70	1.65	2 31	13.21
6696	Water's H. G. Dis. Bone and Potash	" " "	4.00	4.25	90	2.23	10.48
6699	Cotton Queen	" " "	6 00	4.30	2.00	2.00	12.30
6705	Cahaba Acid Phos. and Potash Mixture	White & Speigner, Goodwater, Ala	12.75	4.20	.70	1.71	18.66
6713	Dis. Bone and Potash	Ben. Jennings, Seale. Ala	7.95	3.45	1.10	3.34	14.74
6716	Eddystone Bone and Potash	W. H. Bynum, Boaz, Ala	4.40	7.40	5 50	2.13	13.93
6723	"Guano"	J. I. Brewer, Tabor, Ala	9.90	3 40	2.20	1.48	14.78
6728	No. 1	J. E. Smith, Stroud, Ala	4.95	7.39	.76	2.21	14.55
6733	Dis. Bone with Potash	R. F. Gilbert, Porterville, Ala	5.75	6 39	.56	1.56	13.70
6737	Dis. Bone and Potash	Gunter & Ealam, Gantt, Ala	6.50	3.94	3.46	2.73	13.17

Analyses Reported by State Chemist from July 1, 1900, to July 1, 1901

Acid Phosphate with Potash.

Station No.	Name of Sample.	By Whom Sent.	Phosphoric Acid. Water Soluble.	Phosphoric Acid. Citrate Soluble.	Phosphoric Acid. Acid Soluble.	Potash.	Commercial Value
6750	Special Potash Mixture	R. Q. Edmonson & Bro., Eufaula, Ala	5.00	4.92	4.08	4.12	14.04
6752	No. 10—4's	T. L. Johnson & Co., Gadsden, Ala	6.70	5.13	2.42	3.37	15.20
6763	Opelika Acid Phos. & 2% Potash	Opelika Chemical Co., Opelika, Ala	6.85	6.06	2.28	2.17	15.09
6764	Potash Acid Phosphate	.. ..	7.75	6.95	1.30	2.02	16.72
6765	Schuessler Bro's. H. G. Bone & Potash	.. ..	7.00	5.25	2.50	2.23	14.48
6766	.. .. XXX	.. ..	8.20	6.18	2.42	1.72	16.10
6767	.. & Co's H. G.	.. ..	7.00	4.40	2.80	2.41	14.11
6788	English Acid Phos, with 2% Potash	Montgomery Fertilizer Co., Mont'gy, Ala	6.95	6.33	2.42	2.34	15.62
6789	Montgomery Acid Phos. and Potash	.. ..	6.50	5.89	2.46	2.37	14.76
6790	Dis. Bone and Potash	.. ..	7.75	6.95	2.39	1.18	15.88

6804	Alkaline Acid Phos. 4% Potash........	Montgomery Fertilizer Co., Mont'gy, Ala.	5.65	3.78	1 92	4 06	13.49
6816	4% Acid Phosphate....................	G. W. Roberts & Co., Collinsville, Ala...	.90	5.75	.80	4.25	10.90
6831	Potash Acid.....	White & Aubrey, Roanoke, Ala..........	11.90	2.70	1.30	1.64	16.24
6832	Pa'apsco Bone & Potash.....	.. ..	7.00	4 20	1.50	2.67	14.87
6853	B'ham Potash Mixture................	W. J. Mullins, Clanton, Ala............	8.15	4.86	.64	2.02	16.03
6859	No. 1 Eddystone Bone & Potash.......	Montgomery Bros., Lincoln, Ala	6.45	5.95	4.70	1.86	14.26
6863	Adair's Formula	Jno. T. Tabor, Keener, Ala......	6.85	6.31	1.84	2.22	15.38
6878	Howle Bros' Phos. & Potash.....	Howle Bros., Wetumpka, Ala............	10.05	5 18	2.12	1.16	16.31
6888	Eagle Dis. Bone & Potash	L. O. Cox, Boaz, Ala	5.75	6.50	3.20	1.00	13.25
6900	H G. Bone & Potash..	T. B. Williams, Cullman, Ala	8.50	4.66	7.14	1.59	12.75
6906	Tallapoosa Dis Bone and Potash........	Tallapoosa Oil Co., Alex. City, Ala......	7.75	4.85	.70	2.00	14.60
6907	Our Best Fertilizer Bone and Potash....	.. ..	7.60	4.75	0.40	1.68	14.03
6908	Coley & Sandlin's Special Bone & Potash	.. ..	7 85	4.94	.66	1.63	14.42
6222	Cahaba Acid Phos. & Potash Mixture...	B'ham Fertilizer Co., Birmingham, Ala...	8.80	5.35	.30	2.18	16.33
6437	Bone & Potash	R. W. Allen & Co., LaFayette, Ala.......	8.55	3.67	2.08	2.80	15.02

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Acid Phosphate

Station Number.	Name of Sample.	By Whom Sent.	Phosphoric Acid. Water Soluble.	Phosphoric Acid. Citrate Soluble.	Phosphoric Acid. Acid Soluble.	Commercial Value.
6206	High Grade Acid	Ozark Cotton S. O. M. and Fert. Co. Ozark, Ala.	11.95	3 12	.96	15.07
6220	B'ham High Grade Acid Phosphate	Birmingham Fertilizer Co., Birmingham, Ala.	12.73	3.79	.20	16 52
6221	Birmingham Standard Grade Phosphate.	" " " " "	11.33	3.62	.23	14.95
6227	H. G. Acid Phospate (Light)	Ozark Cotton S. O. M. and Fert. Co., Ozark, Ala.	12 00	2.79	.44	14 79
6228	H. G. Acid Phosphate (Dark)	.. ..	12.30	4.24	1.76	16.54
6233	English Dis. Bone Phosphate	Troy Fertilizer Co., Troy, Ala	9.70	3.71	5.42	13.41
6234	Troy Acid Phosphate	.. ..	9.20	3.44	5.04	12.64
6235	H. G. Acid Phospnate	.. ..	9.40	3 26	4.94	12.66
6236	English Acid Phosphate	.. ..	9.45	2.56	5.24	12.01
6252	Acid Phosphate	P. R. Tunstall, Mobile, Ala.	11.60	6.10	1.20	12.20

6253	Acid Phosphate	T. Y Connor, Tuskegee	11.30	5.90	1.00	17.20
6262	B'ham H. G. Acid Phosphate	Birmingham Fertilizer Co., Birmingham, Ala.	13.20	4.61	.34	17.81
6263	.. ..	.. ..	12.55	4.07	.48	16.62
6264	.. ..	.. ..	12.05	2.80	.10	14.85
6274	Acid	G. W. McKiny, Five Points, Ala	6.00	5.57	1.68	11.57
6276	Acid Phosphate	W. W. Mizell, Grimes, Ala	13.00	3.13	.22	16.13
6277	Phosphate	W. L. Patterson, Oswichee, Ala	5.25	3.77	1.78	10.02
6285	Acid Phosphate	W. J. Hulto, Abbeville, Ala	8.15	5.15	.90	13.30
6290	Oil Mill Phosphate	Dadeville Oil Mill, Dadeville, Ala	11.35	3.67	.48	15.02
6294	H. G. Acid Phoshpate	Troy Fertilizer Co., Troy, Ala	10.15	3.58	.52	13.73
6296	Acid	S. M. Day, Five Points, Ala	11.20	4.98	.42	16.18
6307	H. G. Acid Phosphate	V. M. Harris, Kent, Ala	10.15	7.46	1.64	17.61
6316	Stono Dis. Bone	R. A. Rsssell & Co, Gaylesville, Ala	4.25	10.00	1.00	14.25
6319	Wando	.. ..	10.70	4.18	.72	14.88
6320	Acid Phosphate	D. H. Lewis, Gordon, Ala	1.00	8.95	2.20	9.95
6321	Diamond	O. & C. P. Dumas, Arlington, Ala	12.30	3.22	.08	15.52
6322	Georgia State Grange Acid Phosphate	Wright, Henderson & Co., Elba, Ala	10.00	3.06	1.44	13.06
6323	Troy H. G. Acid	.. ..	11.20	1.96	4.74	13.16

Analyses Reported by State Chemist from July 1, 1900 to July 1, 1901.

Acid Phosphates—Continued.

Station No.	Name of Sample.	By Whom Sent.	Phosphoric Acid. Water Soluble.	Phosphoric Acid. Citrate Soluble.	Phosphoric Acid. Acid Soluble.	Commercial Value.
6328	Montgomery Phosphate	Jno. A. Nicholls, Childersburg, Ala	11.50	4.32	.88	15.82
6332	P. & H. Royal Acid Phosphate	Sanders & Son, Columbia, Ala	11.50	3.35	1.10	14.85
6335	Acid Phosphate	H. M. Beach & Son, Columbia, Ala	13.00	2.53	.52	15.53
6343	Ox H. G. Dis. Bone	T. C. Masterson, Aorca, Ala	11.50	4.26	1.94	15.76
6346	Scott's H. G. Acid	C. A. Steifelmeyer, Hanceville, Ala	10.80	3.77	1.18	14.57
6358	Dis. Bone	Graves & Burdin, Deposit, Ala	8.20	2.82	7.38	11.02
6366	B'ham H. G. Phosphate	S. A. Stewart, Hartselle, Ala	11.50	2.79	.66	14.29
6372	Read's Matchless Acid		9.25	5.10	2.00	14.35
6376	Cahaba H. G. Phosphate	S. F. Alston, Tuscaloosa, Ala	11.40	4.75	1.60	16.15
6381	Acid Phosphate	W. D. Hamilton, Guin, Ala	8.00	5.09	5.56	13.09

6384	Scott's H. G. Acid PhOsphate	C. A. Steifelmeyer, Cullman, Ala	14.00	2.34	.36	16.34
6386	B'ham Acid Phosphate	" " " "	9.90	3.74	.76	13.64
6388	Atlas Acid Phosphate	" " " "	14.40	2 98	1.22	17.38
6392	Ga. State Standard Acid Phosphate	Law & Davis, Lincoln, Ala	3.55	9.79	2.26	13.54
6393	Scott's H. G. Phosphate	" " " "	9.10	6.24	2.16	15.34
6397	Teague's Acid Phosphate	S. F. Teague, Birmingham, Ala	9.30	6.14	3.16	15.44
6401	Scott's H. G. Acid	T. H. & A. B. Stephens, Seaborn, Ala	10.35	5.94	1.66	16.29
6404	B'ham H. G. Acid Phosphate	F. Ogden & Son, Sulligent, Ala	10.15	4.15	.70	14.30
6407	Ox H. G. Dis. Bone	Porter & Foster, Town Creek, Ala	13.65	3.82	1.48	17.47
6409	Ala. Acid Phosphate	J. B. Gray & W. W. Gulledge, Ohatchie, Ala	7.95	4.85	5.00	12.80
6426	H. G. Acid Phosphate	J. R. G. Howell, Dothan, Ala	5.05	8.89	1.76	13.94
6430	Dis. Bone Acid	Weathers, Swann & Co., Roanoke, Ala	8.10	5.29	.56	13.39
6433	Tuscaloosa Acid Phosphate	Tuscaloosa C. S. Oil Co., Tuscaloosa, Ala	13.95	3.98	.62	17.88
6435	H. G. Acid Phosphate	Hughes Bros., Florala, Ala	12.75	5.56	1.44	18.31
6440	Troy Acid Phosphate	Troy Fertilizer Co., Troy, Ala	9.85	4.50	2.50	14.35
6441	H. G. Acid Phosphate	" " " "	9.25	4.48	1.72	13.73
6442	English Acid Phosphate	" " " "	9.90	3.71	3.60	13.61
6443	English Dis. Bone Phosphate	" " " "	9.60	3.93	2.72	13.53

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Acid Phosphates—Continued.

Station No.	Name of Sample.	By Whom Sent.	Phosphoric Acid. Water Soluble.	Phosphoric Acid. Citrate Soluble.	Phosphoric Acid. Acid Soluble.	Commercial Value.
6450	Excelsior Acid Phosphate	P. J. Ham & Son, Elba, Ala	13.40	3.47	.38	16 87
6451	Pomona	.. ..	1.75	3.47	.18	16 22
6457	Ga. State Grange Acid Phosphate	Hilton, Bently & Cosby, Brantley, Ala	10.10	4 05	1.30	14.15
6465	H. G. Acid Phosphate	J. T. Ramage, Brundidge, Ala	13.55	3 16	2 51	16.71
6466	.. ..	.. ..	11.95	6.08	1.98	18.03
6467	.. .. ..	.. ..	9 54	7.17	1.88	16 62
6471	Goulding's H G. Acid Phosphate	W. F. McKenzie, Greenville, Ala	14.85	3.42	.88	18.27
6474	J. C. Akin & Son's No. Acid Phosphate	J. C. Akin & Son, Notasulga, Ala	10.35	4.41	4.04	14.76
6477	H G. Acid Phosphate	First Bank of Elba, Elba, Ala	12.50	2.67	3.58	15.17
6486	.. .. ..	W. E. Townsend, Elrath, Ala	.95	9.82	1.48	10.77

6494	H. G. Acid Phosphate	Burks & Coston, Brantley, Ala	8.55	4.51	4.84	13.06
6496	H. G. Dis. Bone	M. F. Patterson, Falkville, Ala	12.50	3.50	3.60	16.00
6501	Acid Phosphate	McMillan & Harrison, Mobile, Ala	14.20	3.65	0.20	17.85
6504	H. G. Acid Phosphate	W. S. Crass, Pelham, Ala	11.53	3.21	1.56	14.76
6506	" " "	Troy Fertilizer Co., Troy, Ala	15.30	1.76	1.94	17.06
6507	" " "	G. A. Sanders, Luverne, Ala	15.25	2.34	3.26	17.59
6511	" English Acid Phosphate	A. J. Pittman, Wehodkee, Ala	10.45	5.29	4.76	15.74
6515	H. G. Dis. Bone	W. A. Gage & Co., Town Creek, Ala	12.25	4.42	2.08	16.67
6519	Dis. Bone	Phillips Bros., Oxford, Ala	6.95	8.30	1.00	15.25
6523	Scott's H. G. Acid Phosphate	Ingram & Co., Anniston, Ala	12.10	4.61	1.04	16.17
6526	Eddystone Dis. Bone	J. Markentepe, Cullman, Ala	10.75	5.89	3.66	16.64
6529	H. G. Acid Phosphate	S. N. Power, Elba, Ala	13.00	4.07	1.58	17.07
6530	S. & Co's H. G. English Acid Phosphate	Schuessler & Co., Roanoke, Ala	9.45	4.91	5.74	14.36
6537	Pure H. G. Acid Phosphate	Britt & Johnson, Wetumpka, Ala	11.80	3.62	.58	15.42
6539	H. G. Acid Phosphate	McEntyre, Henderson & Adams, Ozark, Ala	13.00	3.81	3.84	16.81
6546	" " "	B. Bullard, Elba, Ala	9.35	7.27	.48	16.62
6549	Imperial Dis. Bone	George Kroell, Montevallo, Ala	11.35	3.88	.82	15.23
6551	H. G. Acid Phosphate	H. R. & H., Brantley, Ala	13.35	5.23	3.32	18.58

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Acid Phosphates—Continued.

Station No.	Name of Sample.	By Whom Sent.	Phosphoric Acid. Water Soluble.	Citrate Soluble.	Acid Soluble.	Commercial value.
6558	B'ham H. G. Acid Phosphate	Geo. M. Truss & Co.. Springville, Ala	13.95	5.10	.20	$19 05
6562	Acid Phosphate	J. O. Hodges, Ashville, Ala	9.70	6.00	2.50	15.70
6564	Bear Dis. Bone	A. P. Howison, Randolph, Ala	13.00	5.76	2.84	18.76
6569	H. G. English Acid	M. W. Carlyle & Bro., Roanoke, Ala	6 90	6.15	6.80	13 05
6576	Matchless Acid Phosphate	Sessions & Mizell, Enterprise, Ala	7.90	4.19	3.76	12.09
6580	Birmingham Acid	T. A. Howle & Co., Oxford, Ala	6.75	7.08	.92	13.83
6585	Acid Phosphate	F. T. & J. C. Butler, Paint Rock, Ala	7.95	5.16	5.84	'3.11
6589	Imperial Acid	T. G. Land, Cullman, Ala	12.20	3.00	1.30	15.20
6589	Stern's H. G. Acid Phosphate	Chapman & Co., Geneva, Ala	12.70	6.10	1.70	18.80
6592	No. 1 Wet Phosphate	J. S. Collins, Geneva, Ala	3.50	6.99	4.56	10.49

6593	No. 2 Wet Phosphate	J. S. Collins, Geneva, Ala	12.15	6.80	.90	18.95
6595	Crescent City Acid Phosphate	Crutcher & Ward, Cuba, Ala	12 60	4.09	2.76	16.60
6596	I. X. L. Acid Phosphate	.. .. ..	12.80	5.51	2.04	18.31
6298	Read Phosphate	M. P. White, Attalla, Ala	9.00	5.68	.92	14.68
6600	Scott's H. G. Acid Phosphate	W. J. Silbert, Gadsden, Ala	12.35	3.82	.98	16.17
6602	I. X. L. Phosphate	Chas. Ivey, Evergreen, Ala	10.40	4.46	5.24	14.86
6604	H. G. Acid Phosphate	Zena Sheperd, Georgiana, Ala	11.10	5.22	2.28	16.32
6606	.. .. ..	J. I. Covington, Bertha, Ala	8.70	5.82	.98	14.52
6612	Acid Phosphate	J. W. Grace. Elkmont, Ala	8.50	4.54	5.86	13.04
6614	Tenn. Valley Acid Phosphate	J. C. Hartselle & Son, Hartselle, Ala	6.65	4.26	6.44	10.91
6615	Florence Acid	.. .. ..	8.35	5.45	6.40	13.80
6618	.. .. Phosphate,	W. A. Shaw, Winfield, Ala	8.45	4.93	4.02	13.38
6620	Tuscaloosa Acid Phosphate	C. R. Maxwell, Northport, Ala	13.65	4.58	1.62	18.23
6623	Bear H. G. Dis. Bone	Bean & Murray, Heflin, Ala	6.95	8.13	1.42	15.18
6627	Sunny South Acid Phosphate	Elrod & Gibson, Collinsville, Ala	10.10	5.42	3.08	15.52
6629	Ox Acid Phosphate	Eranzen & Olson, Thorsby, Ala	9.60	6.49	2.86	16.00
6630	Ox H. G. Dis Bone	.. .. ..	9.45	5.33	2.12	14.78
6632	Cahaba Acid Phosphate	T. U. Crumpton, Maplesville, Ala	9.80	3.01	.54	13.71

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Acid Phosphates.

Station Number.	Name of Sample.	By Whom Sent.	Phosphoric Acid. Water Soluble.	Phosphoric Acid. Citrate Soluble.	Phosphoric Acid. Acid Soluble.	Commercial Value.
6638	Acid	Asa Griffith, Hanceville, Ala	12.20	4.30	3.20	16.50
6639	Birmingham Acid	.. ..	10.30	3.30	1 05	13.60
6644	XXX Dis. Bone	G. W. Wise, Madison, Ala	7.35	5.65	3.25	13.00
6645	Sunny South	.. ..	9.25	5.35	3.55	14.60
6646	Meridian Southern Acid	G. H. Amos, Duck Spring, Ala	11.65	4.15	2 30	15.80
6652	Georgia State Grange Acid	F. D. Bynum, Bynum, Ala	3.75	9.70	1.45	13.45
6655	A. G. Winkler's H. G. Acid Phosphate	A. G. Winkler, Greenville, Ala	17.20	1.75	.25	18.95
6657	Talladega Acid Phosphate	John H. Wilson, Jenifer, Ala	13.30	3.20	.70	16.50
6660	Ox H. G. Dis. Bone	Hertzell & Anderson, Madison, Ala	11.10	7.90	.40	19.00
6661	Cahaba Acid Phosphate	John H. Wilson, Jenifer, Ala	13.20	3.85	.40	17.00

6663	English Acid Phosphate	W. W. Burnett, Geneva, Ala	12.00	4.45	2.00	16 45
6666	Port Royal Dis Bone	Lull & Lacey, Wetumpka, Ala	12.35	2.15	.70	14.50
6670	Acid Phosphate	Stewart & Hazelwood, Eden, Ala	5.40	5.77	.48	11.17
6671	Dis Bone	.. ..	8.35	3.34	.36	11.79
6673	Georgia State Standard	D. D. Hughes, Lebanon, Ala	2 30	10.73	2.02	13.03
6675	Prolific Acid Phosphate	D. D. EcGowen, Cuba, Ala	14.50	4.40	.80	18.90
6476	Acid Phosphate	Cash Supply Co., Mountafn Creek, Ala	11.60	2 07	.08	13 67
6681	No. 1. Dis. Bone	Trawick & Jernigan, Opelika, Ala	9.50	4.86	3.34	14.36
6682	No. 2 Dis. Bone	.. ..	10.00	4.25	3.40	14.75
6690	I. X. L. Phosphate	W. D. Brown, Graville, Ala	11.85	4.05	2.50	15.90
6691	Goulding's H. G. Phosphate	.. ..	12.50	3.60	1.45	16.10
6692	Alabama Pure H. G. Phosphate	.. ..	11.10	4.65	1.95	15.75
6701	Alabama Phosphate	Green & Mullins, Active, Ala	10.55	5.20	2.55	15.75
6704	Tallapoosa Dis. Bone	White & Spigner, Goodwater, Ala	10.40	1.15	4.55	11.55
6711	Phosphate Excelsior Bone Compound	W. C. Perry, Seale, Ala	6.60	6.40	.70	13.00
6716	Eddystone Dis. Bone	W. H. Bynum, Boaz, Ala	8 25	7.85	2.25	16.10
6718	Alabama Acid Phosphate	J. H. Myers, Langston, Ala	14.05	2.80	.40	16.85
6721	No. 1 Acid Phosphate	J. C. Alford, Childersburg, Ala	9.55	8.20	1.05	17.75

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Acid Phosphates—Concluded.

Station No.	Name of Sample.	By Whom Sent.	Phosphoric Acid. Water Soluble.	Phosphoric Acid. Citrate Soluble.	Phosphoric Acid. Acid Soluble.	Commercial value.
6722	No. 2 Acid Phosphate	J. C. Alford, Childersburg, Ala	12.15	6.15	.95	$18.30
6729	Magnet Acid	Davis, Marshall & Co., Mobile, Ala	9 55	6.92	2 98	16.47
6732	Piedmont Acid Phosphate	R. F. Gilbert, Porterville, Ala	7.85	5.71	.54	13.66
6736	H. G. Acid Phosphate	Gunter & Elem, Gantt, Ala	13.45	3.65	2.80	17.10
6742	Cow Acid	McEntire Bros., Cullman, Ala	5.90	8.08	4.62	13.98
6743	Bull Acid	.. ..	7.10	4.87	7.88	11.97
6746	Acid Phosphate	S. W. Henry, Springville, Ala	8.15	5.42	3.98	13.57
6749	XXX Dis. Bone	R. Q. Edmonson & Bros., Eufaula, Ala	6.85	7.12	2.28	13.97
6755	Acid Phosphate	T. L. Johnson & Co., Gadsden, Ala	9.65	5.48	1.32	15.13
6756	J. C. Adkin & Son's No. 1 Acid Phosphate	Opelika Chemical Co., Opelika, Ala	10.80	5.61	2.54	16.41

6757	Griel Bros. English Acid Phosphate	Opelika Chemical Co., Opelika, Ala	10.70	6.59	1.86	17.29
6758	Standard Acid Phosphate	.. ..	11.30	6.00	2.00	17.30
6759	H. G. English Acid Phosphate	.. ..	10.90	6.48	2.02	17.38
6760	S. & Co's H. G. English Acid	.. ..	10.75	6.39	2.46	17.14
6761	H. & T. H. G. Acid Phosphate	.. ..	10.65	6.63	2.52	17.28
6780	H. G. Acid Phosphate	Montgomery Fertilizer Co., Montgomery, Ala.	11.05	5.69	2 26	16.74
6781	Vandiver's XX Acid Phosphate	.. ..	10.25	6.13	2.82	16.38
6782	S. & O. H. G. Acid Phosphate	.. ..	11.05	5.95	2.80	17.00
6783	Thompson's English Acid Phosphate	.. ..	10.95	6.26	1.84	17.21
6784	Star Brand Acid Phosphate	.. ..	10.85	5 76	2.54	16 61
6785	Early Bird H. G. Acid Phosphate	.. ..	10.40	7.25	1.80	17.65
6786	S. & K. English Acid Phosphate	.. ..	11.05	6.81	1 84	17.86
6787	W. L. & Co's H. G. Acid Phosphate	.. ..	11.20	6.18	2.12	17.38
6803	H. G. English Acid Phosphate	.. ..	11.65	4.73	2.42	16.38
6808	H. G. Acid Phosphate	W. B. Willhite, Hartselle, Ala	8.80	6.28	2.52	15.08
6811	Dixie Acid Phosphate	C. W. Bell & Son, Lineville, Ala	10.90	4.87	4.58	15.77
6812	H. G. Dis. Bone	.. ..	5.70	7.45	5.80	13.15
6815	H. G. Acid Phosphate	G. W. Roberts & Co., Collinsville, Ala	4.80	7.49	1.86	12.29

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Acid Phosphate.

Station Number.	Name of Sample.	By Whom Sent	Phosphoric Acid.			Commercial Value.
			Water Soluble.	Citrate Soluble.	Acid Soluble.	
6821	Marietta H. G. Acid	Reeves, Sanders & Co, Heflin, Ala	11.70	5.14	.26	16 84
6824	Sunny South Acid Phosphate	W. B. Vaughn, Elkmomit, Ala	9.00	6.09	6 56	15 09
6827	H. G. Acid Phosphate	F. A. Gulledge, Verbena, Ala	13.95	5.13	0.42	19.08
6828	Ox Dis. Bone	" " " "	10.75	5.17	2 68	15 92
6830	Coweta H. G. Acid	White & Aubrey, Roanoke, Ala	6.90	4.69	3.26	11.59
6838	Sunny South Phosphate	A. B. Vandigraft & Son, Birmingham, Ala	10.50	5.12	2.98	15.62
6842	English Acid Phosphate	E. H. & A. S. Murdock, Coffee Springs, Ala	10.70	6.32	1.38	17.02
6444	Standard Acid Phosphate	Cameron Bros., Notasulga, Ala	9.25	5.79	3 46	15.04
6846	Bear H. G. Dis. Bone	T. L. Neighbors & Bros, Goodwater, Ala	10 50	4.78	3.02	15.28
6852	Birmingham H. G. Acid Phosphate	W. J. Mullins, Clanton, Ala	11.40	4.35	.75	15.75

6856	Marietta H. G. Dis. Bone Acid	West & McMurry, Roanoke, Ala	6.65	4.77	.78	11.42
6858	Eddystone Dis. Bone	Montgomery Bros., Lincoln, Ala	10.45	4.79	2.86	15.24
6861	Adair's H. G Dis. Bone	John T. Tabor, Keener, Ala	10.25	2.10	3.80	12.35
6864	Scott's Acid	Haley Bros., Haleyville, Ala	12.35	4.04	1.06	16.39
6865	Florence Acid	.. ..	8.85	5.60	4.80	14.45
6866	Bear Acid	.. ..	10.15	5.74	3.16	15.89
6871	Howle Bros. Acid Phosphate	Howle Bros., Wetumpka, Ala	11.35	6.48	.52	17.83
6873	Phosphate No. 3	Ozark C. S. Oil Mill and Fert. Co., Ozark, Ala	8.20	7.15	1.40	15.35
6875	Black Diamond Acid	E. P. Duncan, Alexander City, Ala	7.30	7.06	2.54	14.36
6881	Tiger Acid	The J, H. Karter Co., Cullman, Ala	7.90	6.10	6.20	14.00
6884	English Acid Phosphate	T. H. NeEntyre, Coffee Springs, Ala	9.00	5.77	3.08	14.77
6886	Eagle Acid Phosphate	L. O. Cox, Boaz, Ala	5.45	8.01	3.84	13.46
6887	Eagle Dis. Bones	.. ..	6.00	8.14	2.16	14.14
6895	Sunny South Acid	M. Noble, Avery, Ala	9 35	4.54	3.46	13.89
6397	Phosphate	Rintz Turner, Thomasville, Ala	9.65	4.03	1.22	13.68
6899	Acid Phosphate	T. B. Williams, Cullman, Ala	9.70	5.62	3.48	15.32
6904	Eagle Acid Phosphate	S. J. Baird, Guin, Ala	10 55	5.94	5.06	16.49
6905	Tallapoosa H. G. Acid Phosphate	Tallapoosa Oil Co, Alexander City, Ala	9.90	5.35	.70	15.25

Analyses Reported by State Chemist from July 1, 1909, to July 1, 1901.

Acid Phosphate.

Station Number.	Name of Sample.	By Whom Sent.	Phosphoric Acid. Water Soluble.	Phosphoric Acid. Citrate Soluble.	Phosphoric Acid. Acid Soluble.	Commercial Value.
6220	Cahaba H. G. Acid Phosphate	Birmingham Fertilizer Co., Birmingham, Ala.	12.73	3.79	.20	16.52
6220	Earle Terrell & Co's. H. G. Acid Phos.	.. ..	12.73	3.79	.20	16.52
3221	Cahaba Standard Grade Phosphate	.. ..	11 33	3.62	.23	14.95
6220	Prolific Acid Phosphate..	.. ..	12.73	3.79	.20	16.52

Analyses Reported by the State Chemist from July 1, 1900, to July 1, 1901.

Miscellaneous Fertilizers and Fertilizing Materials.

Station No.	Name of Sample.	By Whom Sent.	Phosphoric Acid. Citrate Soluble.	Phosphoric Acid. Acid Soluble.	Phosphoric Acid. Total.	Nitrogen.	Potash.
6214	Cotton Seed Meal	Tucker & Willingham, LaFayette, Ala.	....	....	2.79	7.14	2.06
6215	" " " Off	" " " "	....	....	2.77	6.18	1.62
6216	" " "	Mutual Cotton Oil Co., Columbus, Ga	....	....	......	7.20	....
6217	" " "	Dothan " " " Dothan, Ala	....	....	2.80	7.32	1.89
6218	" " " Off	" " " " " "	....	....	2.88	6.42	1.87
6219	" " "	LaFayette Cotton Oil Co., LaFayette, Ala.	....	....	2.86	6.42	2.01
6255	" " " No. 1	Dadeville Oil Mill, Dadeville, Ala	....	....	2.67	7.11	1.95
6256	" " " No. 2 Off	" " " " "	....	....	2.61	6.86	1.99
6260	" " "	Walter Andrews, LaFayette, "	....	....	2.65	6.84	2.04
6261	" " " Off	" " " "	....	....	2.90	6.96	1.94

Analyses Reported by the State Chemist from July 1, 1900, to July 1, 1901.

Miscellaneous Fertilizers and Fertilizing Materials.

Station No.	Name of Sample.	By Whom Sent.	Phosphoric Acid. Citrate Soluble.	Phosphoric Acid. Acid Soluble.	Phosphoric Acid. Total.	Nitrogen.	Potash.
6283	Cotton Seed Meal No. 2	Greenville Cotton Oil Mill, Greenville, Ala	....	....	2 93	6.96	2.08
6284	" " " 3 Off	" "	....	....	3.10	6 42	1.90
6286	" " " "A"	D. E. Huger & Co , Mobile, Ala	....	....	3.61	6.54	1.92
6287	" " " "Z"	" "	....	....	3 48	6.54	1.79
6308	" " "	J. T. Scott, Buffalo, Ala	....	....	3.10	6 54	1 81
6359	" " "	Jefferson Cotton Oil Mill, B'ham, Ala.	....	....	2.42	7.32	1 88
6360	" " "	Sylacauga Oil Mill, Sylacauga, "	....	....	2.87	7.08	1.72
6361	" " "	Richmond Cotton Oil Mill, Sheffield, Ala	....	....	2 67	6.66	1.72
6362	" " "	B. Schmidt & Son, Lincoln, Ala	....	....	2 97	7.08	1.58
6363	" " "	T. G. Connor, Tuskegee, "	....	....	3.02	6 90	1.62

6364	Cotton Seed Meal	C. C. Woodard, Fruitdale, Ala			3.75	7.08	1.76
6365	" " "	Evergreen M'f'g Co., Evergreen, Ala			2.90	6.84	1.64
6414	" " "	Jackson & Chapman, Grand Bay, "			3.56	6.84	2.15
6488	" " " Off	C. C. Woodard, Fruitdale, "			3.82	7.02	2.32
6489	" " " Bright	" " "			3.25	6.96	1.91
6662	" " "	Leder Oil Mills, Demopolis, "			3.18	6.84	1.84
7048	" " "	" " " " "			3.80	6.96	1.60
6202	Bat Manure & Cave Earth	L. H. Scruggs, Huntsville, "			9.35	2.84	1.51
6203	Coarse Horse Manure	J. F. Duggar, Auburn, "			.52	1.27	1.80
6203	Fine Horse Manure	" " "			.67	.87	1.00
6205	Fertilizer No. 7	Helm Milling Co., Birmingham, "					2.62
6207	Muriate of Potash	Ozark C. S. Oil Mill & Fert. Co., Ozark					56.15
6213	Tankage	B'ham Hide & Tallow Co., B'ham, Ala			10.13	6.04	
6226	Fertilizer No. 1748	Mississippi Station, Starksville, Ala					2.75
6251	German Kainit	Troy Fertilizer Co., Troy, Ala					13.40
6258	Kainit	Trawick & Jernigan, Opelika, Ala					14.12
6281	Ashes	C. C. Woodard, Fruitdale, "			1.85		1.28
6288	Soil	F. Y. Anderson, Birmingham, "			.20	.07	.05

Analyses Reported by the State Chemist from July 1, 1900 to July 1, 1901.

Miscellaneous Fertilizers and Fertilizing Materials—Concluded.

Station No.	Name of Sample.	By Whom Sent.	Phosphoric Acid. Citrate Soluble.	Phosphoric Acid. Acid Soluble.	Phosphoric Acid. Total.	Nitrogen.	Potash.
6289	Soil	Prattville Mercantile Co., Prattville, Ala.			.26	.03	.06
6309	Muriate	C. C. Woodard, Fruitdale, Ala.					51 90
6439	Phosphate Rock	J. C. Adams, Montgomery, Ala.			.45		
6464	Cotton Seed Meal Ash	Huntsville Nursery Co., Huntsville, Ala.	15.68	.60	16.28		1.20
650[illegible]	German Kainit	McMillan & Harrison, Mobile, Ala.					12.64
656[illegible]	No. 1 Phos- Rock	J. A. Alexander, Prattville, Ala.			1.45		
6567	No. 2 " "	" " " "			.40		
6568	No. 3 " "	" " " "			.45		
6586	Kainit	F. T. & J. C. Butler, Paint Rock, Ala.					10.74
6636	Marl	J. F. Jones, Evergreen, Ala.			.23		

6659	Kainit	J. H. Wilson, Jenifer, Ala.	.....	.....	.....	.....	13.14
6731	German Kainit	Davis, Marshall & Co., Mobile, Ala.	.....	.....	.....	.....	14.14
6849	Phosphate Rock	H. S. Houghton, Blount Springs, Ala.	.....	.....	.32	.....	.....
6850	.. ..	Prim & Kimbel, Jackson, Ala.	.....	.....	.22	.....	.....
7049	.. ..	C. F. Austin, Auburn, Ala.	.....	.....	.72	.....	.....
7050	.. ..	A. U. Grouby, Abbeville, Ala.	.....	.....	.34	.....	.....
6211	Pure Tobacco Stems	Helm Milling Co., Birmingham, Ala.	.....	.....	.....	.....	9.13
6212	Mixture Tobacco Stems and Filler	.. ..	.....	.....	.....	.....	2.48

Analyses Reported by State Chemist from July 1st, 1900, to July 1st, 1901.

Miscellaneous Samples from the Commissioner.

Station No.	Name of Sample.	By Whom Sent.	Phosphoric Acid. Water Soluble.	Phosphoric Acid. Citrate Soluble.	Phosphoric Acid. Acid Soluble.	Nitrogen.	Potash.	Commercial value.
6914	No. 806	Commissioner of Agriculture, Montgomery, Ala.	12.70	3.79	.76	.....	2.40	$18.89
6915	" 807	" " " " "	7.40	3.22	3.78	.....	2.59	13.21
6916	" 808	" " " " "	11.95	5.59	.66	.....	.....	17.54
6917	" 809	" " " " "	7.95	5.78	4.32	1.28	2.29	18.60
6918	" 810	" " " " "	11.95	3.10	1.06	.....	2.69	17.83
6919	" 811	" " " " "	6.35	3.15	2.50	1.60	2.59	16.57
6920	" 812	" " " " "	11.85	5.07	.88	....	2.58	19.50
6921	" 813	" " " " "	11.55	5.10	.80	.....	2.40	19.05
6922	" 814	" " " " "	7.35	2.66	3.54	1.60	2.10	16.55
6923	" 815	" " " " "	11.20	6.20	.30	.....	2.05	19.45

6924	No. 816	..	..	..	..	..	7.30	3.78	.12	1.94	2 20	18.71
6925	.. 817	..	..	..	..	..	6.60	3.67	4.08	1.82	2.29	17.66
6926	.. 818	..	..	..	..	..	6.40	4.20	7.70	1.98	2.13	18.27
6027	.. 819	..	..	..	..	..	13.05	3.39	.96	......	....	16.44
6928	.. 820	..	..	..	..	..	6.50	4.54	2.46	1.00	2.45	16.29
6929	.. 821	..	..	..	..	..	7.7C	6.21	5.34	......	......	13 91
6930	.. 822	..	..	..	..	..	7.60	3.53	2.62	1.82	1.80	18.03
6931	.. 823	..	..	..	..	..	7.70	5.60	1.90	1.64	1.60	18.49
6932	.. 824	..	..	..	..	..	9.35	3.55	6.20	......	1.41	14.31
6933	.. 825	..	..	..	..	..	6.35	3.04	5.96	2.14	1.67	17.05
6934	.. 826	..	..	..	..	..	7.75	2.94	1.26	......	2.40	13.09
6935	.. 827	..	..	..	..	..	10.75	2.59	3.36	1.42	2.49	19.81
6936	.. 828	..	..	..	..	..	8.70	2.56	.94	1.96	2.31	19.06
6937	.. 829	..	..	..	..	..	8.70	2.23	1.52	1.30	2.67	17.24
6938	.. 830	..	..	..	..	..	8.35	5.44	.96	......	......	13.79
6939	.. 831	..	..	..	..	..	10.25	4.08	.72	.28	2.38	19.49
6940	.. 832	..	..	..	..	..	7.00	3.84	3.26	1.72	2.40	17.56
6941	.. 833	..	..	..	..	..	8 40	4.23	1.42	1.72	2.05	19.50

Analyses Reported by State Chemist from July 1st, 1900, to July 1st, 1901.

Miscellaneous Samples from the Commissioner—Continued.

Station No.	Name of Sample.	By Whom Sent.	Phosphoric Acid.			Nitrogen.	Potash.	Commercial Value.
			Water Soluble.	Citrate Soluble.	Acid Soluble.			
6942	No. 834	Commissioner of Agriculture, Montgomery, Ala	8.70	6.68	2.12	.18	2.57	$18.45
6943	.. 835	.. ..	9.55	3.19	1.66	1.88	2.56	20.50
6944	.. 836	.. ..	6.95	5.32	8.53	.50	1.32	14.99
6945	.. 837	.. ..	7.95	6.81	7.84	....	....	11.76
6946	.. 838	.. ..	7.95	5.50	2.10	1.72	1.43	19.70
6947	.. 839	.. ..	11.30	6.05	2.20	....	....	17.35
6948	.. 840	.. ..	8.40	4.58	3.82	.98	1.66	17.38
6949	.. 841	.. ..	4.55	4.40	1.00	....	....	13.95
6950	.. 842	.. ..	8.60	3.48	2.12	1.88	2.10	19.44
6951	.. 843	.. ..	....	....	....	....	13.60	13.60

6952	.. 844	..	..	..	..	9.15	3.61	2.34	1.06	2.24	17.97
6953	.. 845	..	..	..	..	12.60	3.50	2.40	......	......	16.10
6954	.. 846	..	..	..	..	6.85	4.15	3.50	1.96	1.54	18.03
6955	.. 847	..	..	..	..	11.70	2.93	1.72	....	......	14.63
6956	.. 848	..	..	..	..	9.00	1.81	1.34	1.76	1.39	17.13
6957	.. 849	..	..	..	..	7.85	3.43	.82	.12	2.22	13.84
6958	.. 850	..	..	..	..	7.20	4.49	4.06	1.88	2.41	19.36
6959	.. 851	..	..	..	..	7.45	3.80	6.65	1.36	1.80	16.86
6960	.. 852	..	..	..	..	6.70	2.98	6.32	1.88	1.49	16.43
6961	.. 853	..	..	..	..	11.65	5.56	1.84	......	.....	17.21
6962	.. 854	..	..	..	..	6.25	4.57	2.28	1.92	2.59	18.79
6963	.. 855	..	..	..	..	7.20	3.92	.78	2.38	2.44	20.22
6964	.. 856	..	..	..	..	5.45	6.62	2.28	......	......	12.07
6965	.. 857	..	..	..	..	10.40	4.44	3.66	......	......	14.84
6966	.. 858	..	..	..	..	7.50	4.40	5.40	2.18	1.43	19.43
6967	.. 859	..	..	..	..	6.65	3.12	2.68	1.70	2.39	16.92
6968	.. 860	..	..	..	..	5.05	10.42	1.68	......	......	15.47
6969	.. 861	..	..	..	..	5.50	4.89	6.66	1.88	2.63	18.28

Analyses Reported by State Chemist from July 1, 1900, to July 1, 1901.

Miscellaneous Samples from the Commissioner.

Station Number.	Name of Sample.	By Whom Sent.	Phosphoric Acid.			Nitrogen.	Potash.	Commercial Value.
			Water Soluble.	Citrate Soluble.	Acid Soluble.			
6970	No. 862	Commissioner of Agriculture, Montgomery, Ala.	9.80	7.37	4.38	....	......	17.17
6971	" 863	" " " " "	11.20	5.06	.84	....		16.26
6972	" 864	" " " " "	8.65	4.65	2.30	2.04	3.83	20.84
6973	" 865	" " " " "	......	......	......	.....	12.28	12.28
6974	" 866	" " " " "	12.40	6.54	2.26	....		18.94
6975	" 867	" " " " "	4.90	6.06	6.94	1.86	2.31	18.48
6976	" 868	" " " " "	12.65	3.93	.92	...	.52	17.10
6977	" 869	" " " " "	13.15	3.87	1.08	......	....	17.02
6978	" 870	" " " " "	13.00	5.20	1.00	...	.....	18.20
6979	" 871	" " " " "	8.10	4.85	3.20	.82	2.28	17.53

698[illegible]	No. 872	..	..	..	..	..	1.65	12.79	2.06	.....	......	14.44
6981	.. 873	..	..	..	..	..	7.45	8.02	1.38	....	......	15.47
6982	.. 874	..	..	..	..	..	6.80	3.25	2.40	1.72	2.75	17.62
6983	.. 875	..	..	..	..	..	7.25	3.96	2.94	2.30	2.14	19.79
6984	.. 876	..	..	..	..	..	6.10	3.49	2.66	1.84	1.91	16.65
6985	.. 877	..	..	..	..	..	5.44	12.34	.62	.....	.	17.78
6986	.. 878	..	..	..	..	..	7.75	3.47	5.38	1.72	1.64	17.7[illegible]
6987	.. 879	..	..	..	..	..	8.45	5.11	4.84	1.04	1.31	17.7[illegible]
6988	.. 880	..	..	..	..	..	9.10	5.59	3.56	.68	1.67	18.25
6989	.. 881	..	..	..	..	..	5.12	10.19	.54	.02	1.42	16 79
6990	.. 882	..	..	..	..	..	10.85	3.28	.52	.04	1.19	15 43
6991	.. 883	..	..	..	..	..	5.25	3.71	.44	1.20	3.00	15.32
6992	.. 884	..	..	..	..	..	6.90	2.90	.95	......	2.13	11.93
6993	.. 885	..	..	..	..	..	10.90	4.69	1.54	.....	.....	15.59
6994	.. 886	..	..	..	..	..	7.05	6.35	2.10	.16	2.41	16.26
6995	.. 887	..	..	..	..	..	8.85	2.95	2.20	.....	......	12.80
6996	.. 888	..	..	..	..	..	8.05	2.09	1.36	......	....	10.14
6997	.. 889	..	..	..	..	..	9.70	.35	6.70	2.02	1.69	17.40

Analyses Reported by State Chemist from July 1st, 1900, to July 1st, 1901.

Miscellaneous Samples from the Commissioner—Continued.

Station No.	Name of Sample.	By Whom Sent.	Phosphoric Acid. Water Soluble.	Phosphoric Acid. Citrate Soluble.	Phosphoric Acid. Acid Soluble.	Nitrogen.	Potash.	Commercial Value
6998	No. 890	Commissioner of Agriculture, Montgomery, Ala	7.10	5.00	4.00	1.78	1.34	$18.42
6999	.. 891	.. ..	5.80	4.88	1.22	2.32	2.27	19.45
7000	.. 892	.. ..	6 00	6.54	1.96	1.24	1.54	17.55
7001	.. 893	.. ..	7.35	3.04	3.26	1.66	2.29	17.3[illegible]
7002	.. 894	.. ..	4.55	9.37	.98	3.54	2.41	25.24
7003	.. 895	.. ..	2.65	8.14	.86	1.92	2.56	18.73
7004	.. 896	.. ..	2.20	9.38	.62	2.04	1.91	19.20
7005	.. 897	.. ..	2.30	9.66	1.84	2.40	2.64	21.32
7006	.. 898	.. ..	8.55	3.65	3.26	1.24	2.28	17.99
7007	.. 899	.. ..	9.95	1.35	9.90	.....	.....	11.30

7008	.. 900	..	..	..	..	8.95	2.65	2.80	1.28	1.04	16.23
7009	.. 901	..	..	..	..	8.20	3.39	1.96	....	2.24	13.83
7010	.. 902	..	..	..	..	11.60	5.11	1.54	.12	.13	17.18
7011	.. 903	..	..	..	..	11.25	6.01	3.04	08	.10	17.58
7012	.. 904	..	..	..	..	5.00	4.97	1.98	.....	2.77	12.74
7013	.. 905	..	..	..	..	7.90	4.87	6.48	.10	2.91	15.86
7014	.. 906	..	..	..	..	6.80	3.51	1.04	2.08	1 51	17 64
7015	.. 907	..	..	..	..	7.70	3.52	.88	1.96	2.51	19.22
7016	.. 908	..	..	..	..	5.10	3.81	2.04	1.98	2.72	17.17
7017	.. 909	..	..	..	..	12 70	3.28	4.82	.....	.....	15.98
7018	.. 910	..	..	..	..	7.40	2.06	3.64	2 04	2.09	17.26
7019	.. 911	..	..	..	..	7.75	5.49	1.36	1.02	1.28	17.18
7020	.. 912	..	..	..	..	8.30	7.43	2.92	..	2.00	17.73
7021	.. 913	..	..	..	..	6.85	5.67	4 28	.	.....	12.52
7022	.. 914	..	..	..	..	8.00	2.12	3.98	1.38	2 18	16.16
7023	.. 915	..	..	..	.	7.95	4 21	2.64	1.34	1.22	17.13
7024	.. 916	..	..	..	..	9.25	5.63	2.92	.....	.....	14.88
7025	.. 917	..	..	..	..	9.00	3.44	1.96	1.56	1.57	18.38

Analses Reported by State Chemist from July 1, 1900 to July 1, 1901.

Miscellaneous Samples from the Commissioner—Concluded.

Station No.	Name of Sample.	By Whom Sent.	Phosphoric Acid. Water Soluble.	Phosphoric Acid. Citrate Soluble.	Phosphoric Acid. Acid Soluble.	Nitrogen.	Potash.	Commercial Value
7026	No. 918	Commissioner of Agriculture, Montgomery, Ala.	9.15	.50	1.90	1.48	2.73	16.52
7027	.. 919	.. .. ..	7.60	3.11	2.74	2.02	2.00	18.37
7028	.. 920	.. .. ..	8.06	3.74	.66	......	3.22	15.56
7029	.. 921	.. .. ..	9.20	1.54	1 36	1.70	2.77	18.27
7030	.. 922	.. .. ..	9.25	4.02	1.58	1.62	1.36	19.17
7031	.. 923	.. .. ..	10.35	5 64	5.86	......	......	15.99
7032	.. 924	.. .. ..	7.20	8.07	2.08		1.80	17.07
7033	.. 925	.. .. ..	6.40	3.72	2.78	1.60	1.56	16.55
7034	.. 926	.. .. ..	6.35	2.15	2.60	1.34	2.24	14.49
7035	.. 927	.. ..	7.90	5.17	1.68	.98	.87	16.63

7036	.. 928....................	..	..	..	9.35	2.70	1.80	1.64	2.06	18.70
7037	.. 929....................	..	..	..	13.50	2.18	1.72	......	......	15.68
7038	.. 930....................	..	..	..	6.25	6.33	1.32	......	.....	12.58
7039	.. 931....................	..	..	..	6.85	5.96	6.04	......	2.28	15 09
7040	.. 932....................	..	..	..	6.00	6.09	7.46	1.40	1.49	17.50
7041	.. 933....................	..	..	..	5.85	3.81	4.54	1.60	2 32	16.46
7042	.. 934....................	..	..	..	6.45	4.46	4.04	1.58	1.49	16.82
7043	.. 935....................	..	..	..	8.15	2.64	1.76	2.02	1.87	18.32
7044	.. 936....................	..	..	..	8.15	3.89	2.76	1.46	1.76	17.89
7045	.. 937....................	..	..	..	13.40	5.34	1.06	.....	......	18.74
7046	.. 938....................	..	..	..	8.50	5.34	2.66	1.10	1.12	18.04
7047	.. 939....................	..	..	..	7.60	2 90	3.20	2.20	2.11	18.77

Guaranteed Analyses of Commercial Fertilizers, Filed in the Office of the Commissioner of Agriculture by Dealers and Manufacturers.

When Received.	Name of Fertilizer or Chemical, by Whom Manufactured, and Where Manufactured.	Weight of Package.	Guaranteed Analysis.					Relative Commercial Value.
			Nitrogen.	Phosphoric Acid			Potash.	
				Water Soluble.	Citrate Soluble.	Acid Soluble.		
1900 Oct. 1	Mobile Acid Phosphate & Potash, manufactured by Mobile Phosphate Company, Mobile, Ala	200	....	8–10	2–4	2–3	1–2	$ 11 16
..	Mobile Dissolved Bone and Potash, manufactured by Mobile Phosphate Company, Mobile, Ala	200	....	8–10	2–4	2–3	2–3	12 17
..	Mobile Alkali Bone Phosphate, manufactured by Mobile Phosphate Company, Mobile, Ala	200	....	6–8	2–4	2–3	4–5	12 17
..	Mobile Ammoniated Fertilizer, manufactured by Mobile Phosphate Company, Mobile, Ala	200	2.06–3	7–9	2–4	15–2	1–2	15 77–
..	Genuine German Kainit, manufactured by Mobile Phosphate Company, Mobile, Ala	200	....	....	.....	.....	12–13	23 40 12 13
..	Mobile 446 Special Truck, manufactured by Mobile Phosphate Company, Mobile, Ala	200	3.30-4.50	3–4	1–2	1–2	4–8	19 24–
..	Mobile H. G. Truck Fertilizer, manufactured by Mobile Phosphate Company, Mobile, Ala	200	6 60–8	4–5	2–3	1–2	4–6	26 60 28 48–
..	I. X. L. Acid Phosphate, manufactured by Mobile Phosphate Company, Mobile, Ala	200	......	10–12	2–3	2–3	.....	36 40 12 14
..	English Acid Phosphate, manufactured by Mobile Phosphate Company, Mobile, Ala	200	....	12–13	2–3	2–3	.....	14 16
..	Mobile Standard Guano, manufactured by Mobile Phosphate Company, Mobile, Ala	200	1.65–2.05	6–7	2–3	1.50–2	2–3	20 00 14 62–

Oct. 1	KKK Ammoniated Soluble Bone, manufactured by Mobile Phosphate Company, Mobile, Ala	200	85–1.25	8–10	2–3	1.50–2	1–2	13 38–18 50
..	Eclipse Soluble Guano, manufactured by Mobile Phosphate Company, Mobile, Ala	200	1.65–2.05	7–8	2–3	1.50–2	1–2	14 62–20 00
..	Mobile Soluble Bone and Potash, manufactured by Mobile Phosphate Company, Mobile, Ala	200	....	8–10	2–3	2–3	3–4	13 00–17 00
..	Mobile Double Eagle Guano, manufactured by Mobile Phosphate Company, Mobile, Ala	200	1.65–2.50	7.50–8.50	2.50–3 50	1.50–2	2–3	15 62–21 00
..	Rhodes Blood and Bone, manufactured by Mobile, Phosphate Company, Mobile, Ala	200	1.65–2.50	6–7	2–3	1.50–2	2–3	14 62–20 00
..	Mobile Blood Bone and Potash Compound, manufactured by Mobile Phosphate Company, Mobile, Ala	200	1.65–2.50	6–7	2–3	1.50–2	2–3	14 60–20 00
..	Patapsco Guano Co's XX Acid Phos and Potash, manufactured by Georgia Chemical Works, Augusta, Ga	200	......	8	2	2	4	14 00
..	Acid Phos and 4% Potash, manufactured by Georgia Chemical Works, Augusta, Ga	200	....	5	3	2	4	12 00
..	Bone and Potash, manufactured by Georgia Chemical Works, Augusta, Ga	200	....	8	2	2	2	12 00
..	Acid Phosphate, manufactured by Georgia Chemical Works, Augusta, Ga	200	......	10	2	2	1	13 00
..	Dissolved Bone Phosphate, manufactured by Georgia Chemical Works, Augusta, Ga	200	....	11	2	2	.....	13 00
..	Mastodon Ammo. Soluble Phos., manufactured by Georgia Chemical Works, Augusta, Ga	200	1.65	7	3	2	2	16 62
..	Georgia Formula, manufactured by Georgia Chemical Works, Augusta, Ga	200	1.65	7	1	1	2	14 62
..	Mascot Soluble Bone, manufactured by Georgia Chemical Works, Augusta, Ga	200	.82	8	2	2	1	13 30
..	XX Acid Phosphate with Potash, manufactured by Georgia Chemical Works, Augusta, Ga	200	......	8	2	2	4	14 00
..	Acid Phosphate with 4% Potash, manufactured by Georgia Chemical Works, Augusta, Ga	200	....	5	3	2	4	12 00
..	Bone and Potash, manufactured by Georgia Chemical Works, Augusta, Ga	200	....	8	2	2	2	12 00

Guaranteed Analyses of Commercial Fertilizers, Filed in the Office of the Commissioner of Agriculture by Dealers and Manufacturers.

When Received.	Name of Fertilizer or Chemical, by Whom Manufactured, and Where Manufactured.	Weight of Package.	Guaranteed Analysis.					Relative Commercial Value
			Nitrogen.	Phosphoric Acid.			Potash.	
				Water Soluble.	Citrate Soluble	Acid Soluble		
1900 Oct. 1	Acid Phosphate, manufactured by Georgia Chemical Works, Augusta, Ga.	200	....	10	2	2	1	$13 00
..	Dissolved Bone Phosphate, manufactured by Georgia Chemical Works, Augusta, Ga.	200	....	11	2	2	....	13 00
..	Muriate of Potash, manufactured by Georgia Chemical Works, Augusta, Ga.	200	....	.....	....	....	48	48 00
..	Genuine German Kainit, manufactured by Georgia Chemical Works, Augusta, Ga.	200	... .	.	......	...	12	12 00
..	Patapsco Guano Company's Patapsco Guano, manufactured by Georgia Chemical Works, Augusta, Ga.	200	1.65	7	3	2	2	16 62
..	Ammoniated Dissolved Bone, manufactured by Georgia Chemical Works, Augusta, Ga.	200	1.65	7	1	1	2	14 62
..	Baltimore Soluble Bone, manufactured by Georgia Chemical Works, Augusta, Ga.	200	.82	8	2	2	1	13 30
..	Muriate of Potash, manufactured by Georgia Chemical Works, Augusta, Ga.	200	....	......	.....	... ..	48	48 00
..	Genuine German Kainit, manufactured by Georgia Chemical Works, Augusta, Ga.	290	....	....	.....	.. .	12	12 00
..	Pon Pon Crop Grower—Patapsco Guano Co's, manufactured by Georgia Chemical Works, Augusta, Ga.	200	1.00	7	3	1	2	14 80

..	Sea Gull Guano, manufactured by Georgia Chemical Works, Augusta, Ga	200	1.00	7	3	1	2	14 80
..	Md. Am. Diss. Bone and Potash, manufactured by Georgia Chemical Works, Augusta, Ga	200	1.65	6	3	1	1	14 62
..	12% Dissolved Bone and Potash, manufactured by Georgia Chemical Works, Augusta, Ga	200	......	10	2	1.50	.....	12 00
..	High Grade Blood and Bone, manufactured by Armour Fertilizer Works, Kansas City, Kas	200	7	....	3	3	.....	22 60
..	Special, manufactured by Armour Fertilizer Works, Kansas City, Kas	200	7.50	.....	2 50	2.50	.....	23 50
..	Fine Ground Beef Bone, manufactured by Armour Fertilizer Works, Kansas City, Kas	200	2.50	....	12.50	12.50	....	19 50
..	Pure Raw Bone Meal, manufactured by Armour Fertilizer Works, Kansas City, Kas	200	4	.....	6	7	....	17 20
..	Acidulated Animal Bone, manufactured by Armour Fertilizer Works, Kansas City, Kas	200	2	......	12 50	4.50	3	22 60
..	Ammoniated Bone and Potash, manufactured by Armour Fertilizer Works, Kansas City, Kas	200	2.50	3	4	3	1	15 00
..	Blood, Bone and Potash, manufactured by Armour Fertilizer Works, Kansas City, Kas	167	4	6	3	2	7	27 20
..	Fertilizer No. [illegible], manufactured by Armour Fertilizer Works, Kansas City, [illegible]	167	4	5	3	2.50	3	22 20
..	Fertilizer No. [illegible] manufactured [illegible] Fertilizer Works, Kansas City, [illegible]	[illegible]	2.50	5	3	2	6	21 00
..	Fertilizer N[illegible] manufactured [illegible] Fertilizer Works, Kansas City, [illegible]	[illegible]	1 50	5.50	2 50	1.50	5	17 62
..	Fertilizer No. 282, manufactured by Armour Fertilizer Works, Kansas City, Kas	167	1.50	5.50	2.50	1.50	2	14 62
..	Fertilizer No. 281, manufactured by Armour Fertilizer Works, Kansas City, Kas	167	1.50	5 50	2.50	1.50	1	13 62
..	Fertilizer No. 272, manufactured by Armour Fertilizer Works, Kansas City, Kas	[illegible]	1.50	5	2	1.50	2	13 62
..	Fertilizer No. 271, manufactured by Armour Fertilizer Works, Kansas City, Kas	167	1.50	5	2	1.50	1	12 62

Guaranteed Analyses of Commercial Fertilizers, Filed in the office of the Commissioner of Agriculture by Dealers and Manufacturers.

When Received.	Name of Fertilizer or Chemical, by Whom Manufactured, and Where Manufactured.	Weight of Package.	Guaranteed Analyses					Relative Commercial Value
			Nitrogen.	Phosphoric Acid. Water Soluble.	Phosphoric Acid. Citrate Soluble.	Phosphoric Acid. Acid Soluble.	Potash.	
1900 Oct. 1	African Cotton Grower, manufactured by Armour Fertilizer Works, Kansas City, Kansas	167	2.50	5	4	1	3	$ 19 00
..	Potato Fertilizer, manufactured by Armour Fertilizer Works, Kansas City, Kansas	167	3.50	3.50	2.50	1	4	19 40
..	Fertilizer No. 721, manufactured by Armour Fertilizer Works, Kansas City, Kansas	167	1.50	4	3	1.50	1	12 20
..	Fertilizer No 722, manufactured by Armour Fertilizer Works, Kansas City, Kansas	167	1.50	4	3	1.50	2	13 20
..	Fertilizer No. 821, manufactured by Armour Fertilizer Works, Kansas City, Kansas	167	1.50	4	3.	1.50	1	13.20
..	Fertilizer No. 822, manufactured by Armour Fertilizer Works, Kansas City, Kansas	167	1.50	5	3	1.50	2	14 20
..	Ammo D. B. and Potash, manufactured by Armour Fertilizer Works, Kansas City, Kansas	167	1.50	6.50	3.50	2	2	16 20
..	Acid and Potash, manufactured by Armour Fertilizer Works, Kansas City, Kansas	167	......	7	3	1.50	2	12 00
..	Acid and Potash manufactured by Armour Firtilizer Works, Kansas City, Kansas	467	...	6	2	1	4	12 00
..	Acid Phosphate, manufactured by Armour Fertilizer Works, Kansas City, Kansas	200	......	8	4	2	......	12 00

..	Old Plantation Guano, manufactured by Union Fertilizer Co., Atlanta, Ga.	167	1.64.7	6	2	2	2	14 61
..	Union Cotton Grower, manufactured by Union Fertilizer Co., Atlanta, Ga	200	1.64.7	6	2	2	2	14 61
..	Dixie Guano, manufactured by Union Fertilizer Company, Atlanta, Ga.	200	1 64.7	6	2	2	2	14 61
..	Animal Bone and Peruvian Compound, manufactured by Union Fertilizer Co., Atlanta, Ga.	200	82.4	7	3	2	1	13 31
..	Merrimac Guano, manufactured by Union Fertilizer Co, Atlanta, Ga.	200	1.61.7	6	2	2	2	14 61
..	Blood, Bone and Potash, manufactured by Union Fertilizer Co., Atlanta, Ga	200	82.4	7	3	2	1	13 31
..	Free Silver 16 to 1 Compound, manufactured by Union Fertilizer Co., Atlanta, Ga	200	82.4	7	3	2	1	13 31
..	U. C. Dis. Bone, manufactured by Union Fertilizer Co., Atlanta, Ga.	200	....	7	3	2	2	12 00
..	Union Potash Acid Phosphate, manufactured by Union Fertilizer Co., Atlanta, Ga	200	....	7	3	2	2	12 00
..	Dixie Potash Acid Phosphate, manufactured by Union Fertilizer Co., Atlanta, Ga	200	....	7	3	2	2	12 00
..	Merrimac Potash Acid Phosphate, manufactured by Union Fertilizer Co, Atlanta, Ga.	200	....	7	3	2	2	12 00
..	Union Acid Phosphate, manufactured by Union Fertilizer Co., Atlanta, Ga	200	.....	9	3	2	......	12 00
..	Dixie Acid Phosphate, manufactured by Union Fertilizer Co., Atlanta, Ga.	200	.....	9	3	2	......	12 00
..	Merrimac Acid Phosphate, manufactured by Union Fertilizer Co., Atlanta, Ga	200	....	9	3	2	....	12 00
..	Bone and Potash Mixture, manufactured by Union Fertilizer Co., Atlanta, Ga	200	....	6	2	2	4	12 00

Guaranteed Analyses of Commercial Fertilizers, Filed in the Office of the Commissioner of Agriculture by Dealers and Manufacturers—Continued.

When Received.	Name of Fertilizer or Chemical, by Whom Manufactured, and Where Manufactured.	Weight of Package.	Guaranteed Analysis.					Relative Commercial Value.
			Nitrogen.	Phosphoric Acid.			Potash.	
				Water Soluble	Citrate Soluble.	Acid Soluble.		
1900 Oct. 1	Union High Grade Acid Phosphate and Potash, manufactured by Union Fertilizer Co., Atlanta, Ga	200	......	6	2	2	2	$10 00
..	Taylor's Anti-Sheep-Shooter, manufactured by Union Fertilizer Co., Atlanta, Ga	[illegible]	82.4	7	3	2	1	13 31
..	Star Brand, manufactured by Union Fertilizer Company, Atlanta, Ga	[illegible]	82.4	7	3	2	1	13 31
..	U. C. Potash Acid Phosphate, manufactured by Union Fertilizer Co., Atlanta, Ga	200	...	6	2	2	4	12 00
..	Read's Soil Food, manufactured by Read Phosphate Co., Nashville, Tenn	200	1.647–2.47	6–8	2–3	1–2	2–3	14 61
..	Farmer's Special Manure, manufactured by Read Phosphate Co., Nashville, Tenn	200	82–1 64	8–10	2–3	1–2	3–4	15 30
..	Read's Cotton Flower, manufactured by Read Phosphate Co., Nashville, Tenn	200	1.647–2.47	6–8	3–4	1–2	3–4	16 60
..	Wynn's Pacific Guano, manufactured by Read Phosphate Co., Nashville, Tenn	200	1.647–2.47	6–8	2–3	1–2	1–2	13 60
..	Read's Blood and Bone, manufactured by Read Phosphate Co., Nashville, Tenn	200	1.647–2.47	6–8	2–3	1–2	1–2	13 60
..	Read's Matchless Cotton Grower, manufactured by Read Phosphate Co., Nashville, Tenn	200	1.647–2.47	6–8	2–3	1–2	1–2	13 61

..	Read's Farmers' Friend Fertilizer, manufactured by Read Phosphate Co., Nashville, Tenn.	200	1.647-2.47	6-8	3-4	1-2	1-2	14 61
..	Read's Blood, Bone and Potash, manufactured by Read Phosphate Co., Nashville, Tenn.	200	.82-1.647	6-8	2-3	1-2	1-2	13 30
..	Read's Blood and Bone and No. 1, manufactured by Read Phosphate Co., Nashville, Tenn.	200	1.647-2.47	6-8	2-3	1-2	2-3	14 61
..	Read's Blood and Bone Special, manufactured by Read Phosphate Co., Nashville, Tenn.	200	.82-1.647	7-10	3-4	1-2	1-2	13 30
..	Read's Alkaline Bone, manufactured by Read Phosphate Co., Nashville, Tenn.	200	....	8-10	2-3	1-2	2-3	12 00
..	Read's Bone and Potash, manufactured by Read Phosphate Co., Nashville, Tenn.	200	....	8-10	2-3	1-2	2-3	12 00
..	Read's Special Potash Mixture, manufactured by Read Phosphate Co., Nashville, Tenn.	200	....	8-10	2-3	1-2	4-6	14 00
..	Read's Acid Phosphate and Pot., manufactured by Read Phosphate Co., Nashville, Tenn.	200	....	6-8	2-3	1-2	4-6	12 00
..	Read's Matchless Acid Phosphate, manufactured by Read Phosphate Co., Nashville, Tenn.	200	....	10-12	2-3	2-3	...	12 00
..	Read's XXX Dissolved Bone, manufactured by Read Phosphate Co., Nashville, Tenn.	200	....	10-12	3-4	2-3	....	13 00
..	Read's High Grade Acid Phosphate, manufactured by Read Phosphate Co., Nashville, Tenn.	200	....	10-12	4-5	2-3	.....	14 00
..	Read's H. G. Amo. Dissolved Bone, manufactured by Read Phosphate Co., Nashville, Tenn.	200	1.647-2.47	8-10	2-3	1-2	2-3	16 61
..	Satin Staple Guano. manufactured by Read Phosphate Co., Nashville, Tenn.	200	2.05-3.07	6-8	4-6	2-3	2-3	17 75
..	Missing Link Guano, manufactured by Read Phosphate Co., Nashville, Tenn.	200	1.02-1.53	6-8	4-6	2-3	2-3	14 85
..	Up to Date Guano, manufactured by Read Phosphate Co., Nashville, Tenn.	200	.823-1.23	6-8	4-6	2-3	1-2	13 30
..	Peterkin's Improved Formula, manufactured by Read Phosphate Co., Nashville, Tenn.	200	....	8-10	4-6	2-3	2-3	14 00
..	Dissolved Bone and Potash, manufactured by Read Phosphate Co., Nashville, Tenn.	200	....	6-7	4-5	2-3	2-3	12 00

Guaranteed Analyses of Commercial Fertilizers, filed in the Office of the Commissioner of Agriculture, by Dealers and Manufacturers,

When Received.	Name of Fertilizer or Chemical, by Whom Manufactured, and Where Manufactured.	Weight of Package.	Guarantee Analysis. Nitrogen.	Phosphoric Acid. Water Soluble.	Phosphoric Acid. Citrate Soluble.	Phosphoric Acid. Acid Soluble.	Potash.	Relative Commercial Value.
1960 Oct. 1	Available Bone Acid Phosphate, manufactured by Read Phosphate Co., Nashville, Tenn.	200	......	9-10	5-6	2-3	......	$ 14 00
..	Electric Acid Phosphate, manufactured by Read Phosphate Co., Nashville, Tenn.	200	......	8-9	4-5	2-3	......	12 00
..	Read's Bone and Potash, manufactured by Read Phosphate Co., Nashville, Tenn	200	......	8-10	2-3	10-12	2-3	12 00
..	Adair's Acid Phosphate, manufactured by A. D. Adair and McCarty Bros, Atlanta, Ga.	200	......	7-9	3-4	2-4	......	10 00-13 00
..	Acid Phosphate and Pot., manufactured by A. D. Adair and McCarty Bros., Atlanta, Ga.	200	......	7-9	3-4	2-4	1-2	11 00-14 00
..	Ammoniated Dissolved Bone, manufactured by A. D. Adair and McCarty Bros., Atlanta, Ga.	200	1.75-2.50	5-8	3-4	2-4	2-3	14 90-17 00
..	Adair's Soluble Pacific Guano, manufactured by A. D. Adair and McCarty Bros., Atlanta, Ga.	200	1.75-2 50	7-8	3-4	2-4	2-3	16 60-19 00
..	Planters' Soluble Fertilizer, manufactured by A. D. Adair and McCarty Bros., Atlanta, Ga.	300	1.75-2.50	5-8	3-4	2-4	2-3	14.90-17 00
..	McCarty's Soluble Bone, manufactured by A. D. Adair and McCarty Bros., Atlanta, Ga.	200	83-1.25	7-8	3-4	2-4	1-2	13 38-16 00
..	Adair's Special Potash Mixture, manufactured by A. D. Adair and McCarty Bros., Atlanta, Ga.	200	......	5-8	3-4	2-4	4-6	12 00-15 00

..	Adair's Formula, manufactured by A. D. Adair and McCarty Bros., Atlanta, Ga.	200	......	7-9	3-4	2-4	2-3	12-00 15 00
..	McCarty's Potash Formula, manufactured by A. D. Adair and McCarty Bros., Atlanta, Ga	200	....	7-9	3-4	2-4	2-3	12 00- 15 00
..	Special Bone and Potash Compound, manufactured by A. D. Adair and McCarty Bros, Atlanta, Ga.	200	....	7-8	3-4	2-4	4-6	14 00- 17 00
..	Adair's Soluble Bone and Potash, manufactured by A. D. Adair and McCarty Bros., Atlanta, Ga	200	....	7-8	3-4	2-4	2-3	12 00- 15 00
..	Adair's H. G. Dissolved Bone, manufactured by A. D. Adair and McCarty Bros, Atlanta, Ga.	200	......	9-12	3-4	2-4	......	12 00- 15 00
..	Furman Acid Phosphate, manufactured by Furman Farm Improvement Co., Atlanta, Ga	200	....	7-9	3-4	2-4	......	10 00- 13 00
..	Furman Acid Phosphate and Potash, manufactured by Furman Farm Improvement Co., Atlanta, Ga.	200	....	7-9	3-4	2-4	1-2	11 00- 14 00
..	Furman High Grade Fertilizer, manufactured by Furman Farm Improvement Co, Atlanta, Ga.	200	1 75- 2.50	7-8	3-4	2-4	2-3	16 90- 19 00
..	Buffalo Bone Fertilizer, manufactured by Furman Farm Improvement Co., Atlanta, Ga.	200	1.75- 2.50	5-8	3-4	2-4	2-3	14 90- 17 00
..	Furman Soluble Bone, manufactured by Furman Farm Improvement Co., Atlanta, Ga.	200	88-1.25	7-8	3-4	2-4	1-2	13 38- 16 00
..	Farish Furman Formula, manufactured by Furman Farm Improvement Co., Atlanta, Ga.	200	....	7-9	3-4	2-4	2-3	12 00- 15 00
..	Furman's H. G. Dissolved Bone, manufactured by Furman Farm Improvement Co., Atlanta Ga.	200	....	9-12	3-4	2-4	......	12 00- 15 00
..	Swift's Special G. Guano, manufactured by Swift's Fertilizer W'ks, Atlanta, Ga.	200	4.12	7-9	2-4	1-3	3	24.03
..	Swift's Monarch H. G. Guano, manufactured by Swift's Fertilizer Works, Atlanta, Ga.	200	3.29	6-8	2-4	1-3	4	21.21
..	Swift's Cotton King H. G. Guano, manufactured by Swift's Fertilizer Works, Atlanta, Ga.	200	2.47	7-9	2-4	1-3	2	17 92
..	Swift's Eagle H. G. Guano, manufactured by Swift's Fertilizer Works, Atlanta, Ga	200	1.65	7-9	2-4	1-3	2	16 62
..	Swift's Golden Harvest S. G. Guano, manufactured by Swift's Fertilizer Works, Atlanta, Ga.	200	1.65	6-8	2-4	1-3	2	14 62

Guaranteed Analyses of Commercial Fertilizers, Filed in the Office of the Commissioner of Agriculture, by Dealers and Manufacturers.

When Received.	Name of Fertilize. or Chemical, by Whom Manufactured, and Where Manufactured.	Weight of Package.	Guaranteed Analysis. Nitrogen.	Phosphoric Acid Water Soluble.	Phosphoric Acid Citrate Soluble.	Phosphoric Acid Acid Soluble.	Potash.	Relative Commercial Value.
1900 Oct. 1	Swift's Pioneer S. G. Guano, manufactured by Swift's Fertilizer Works, Atlanta, Ga	200	1.24	7–9	2–4	1–3	1	$ 14 47
..	Swift's Cotton Plant S G. Guano, manufactured by Swift's Fertilizer Works, Atlanta Ga	200	1.65	7–9	2–4	1–3	1	14 62
..	Swift's Plow Boy S G. Guano, manufactured by Swift's Fertilizer Works, Atlanta, Ga	200	.82	7–9	2–4	1–3	1	13 30
..	Swift's Homestead H. G. P. & P., manufactured by Swift's Fertilizer Works, Atlanta, Ga	200	....	8–10	2–4	1–3	4	14 00
..	Swift's Plantation S. G. P. & P., manufactured by Swift's Fertilizer Works, Atlanta, Ga	200	....	8–10	2–4	1–3	4	14 00
..	Swift's Wheat Grower S. G. P. & P., manufactured by Swift's Fertilizer Works, Atlanta, Ga	200	....	8–10	2–4	1–3	2	12 00
..	Swift's Atlanta L. G. P. & P., manufactured by Swift's Fertilizer Works. Atlanta, Ga	200	....	8–10	2–4	1–3	1	11 00
..	Swift's Capital H. G. A. Phos., manufactured by Swift's Fertilizer Works, Atlanta, Ga	200	....	10–12	2–4	1–3	......	14 00
..	Swift's Chattahoochie S. G. A. Phos., manufactured by Swift's Fertilizer Works, Atlanta, Ga	200	....	10–12	2–4	1–3	......	12 00

1900 Oct. 1	Swift's Empire Std. Guano, manufactured by Swift's Fertilizer Co., Atlanta, Ga	200	1.65	6–8	2–4	1–3	2	14 62
..	Swift's Dixie Std. Phos. and Pot., manufactured by Swift's Fertilizer Co., Atlanta, Ga	200	......	8–10	2–4	1–3	2	12–00
..	Swift's German Kainit, manufactured by Swift's Fertilizer Co., Atlanta, Ga	100	......	.....	.....	.....	12	11 00
..	Swift's Ground Bone and Blood, manufactured by Swift's Fertilizer Co., Atlanta Ga.	200	13.18	16%	Amo.	......	......	36 00
..	Swift's Muriate Potash, manufactured by Swift's Fertilizer Co., Atlanta, Ga	200	......	.....	.....	.....	50	50 00
..	Swift's Ground Tankage, manufactured by Swift's Fertilizer Co., Atlanta, Ga	200	7.31	Amo.	......	9%	.....	22 46
..	Swift's Nitrate of Soda, manufactured by Swift's Fertilizer Co., Atlanta, Ga	200	15.65	Amo.	......	19%	.....	43 83
..	Bone and Potash, manufactured by Louisville Fertilizer Co., Louisville, Ky	200	......	6	4	1	2	12 00
..	Eagle Ammoniated Bone, manufactured by Louisville Fertilizer Co., Louisville, Ky	200	1 65	6	2	1	2	14 62
..	Eagle Beef, Blood and Bone, manufactured by Louisville Fertilizer Co., Louisville, Ky	200	.82	7	3	1	1	13 29
..	Teague's Beef Blood and Bone, manufactured by Louisville Fertilizer Co., Louisville, Ky	200	.82	7	3	1	1	13 29
..	Teague's Bone and Potash, manufactured by Louisville Fertilizer Co., Louisville, Ky	200	......	7	3	1	2	12 00
..	Teague's Acid Phos., manufactured by Louisville Fertilizr Co., Louisville, Ky	200	......	8	4	1	...	12 00
..	Eagle Guano, manufactured by Louisville Fertilizer Co., Louisville, Ky	200	1.65	7	3	1	2	16 62
..	Eagle Dissolved Bone, manufactured by Louisville Fertilizer Co., Louisville, Ky	200	......	10	4	1	.....	14 00
..	Eagle Acid Phos., manufactured by Louisville Fertilizer Co., Louisville, Ky	200	......	8	4	1	......	12 00
..	Ox Potash Formula, manufactured by Tennessee Chemical Co., Nashville, Tenn	200	......	7	3	1	4	14 00

Guaranteed Analyses of Commercial Fertilizers, Filed in the Office of the Commissioner of Agriculture by Dealers and Manufacturers.

When Received.	Name of Fertilizer or Chemical, by Whom Manufactured, and Where Manufactured.	Weight of Package.	Guaranteed Analysis.					Relative Commercial Value.
			Nitrogen.	Phosphoric Acid			Potash.	
				Water Soluble.	Citrate Soluble.	Acid Soluble.		
1900 Oct. 1	Ox Potash Special, manufactured by Tennesee Chemical Co., Nashville, Tenn	200	....	6	2	1	4	$ 12 00
..	Ox Potash Formula, manufactured by Tennessee Chemical Co., Nashville, Tenn	200	....	8	2	1	4	14 00
..	Ox H. G. Amoniated Bone, manufactured by Tennessee Chemical Co., Nashville, Tenn	200	1.65	6	4	1	2	16 62
..	Ox Cotton Grower, Manufactured by Tennessee Chemical Co., Nashville, Tenn	200	1 65	6	4	1	1	15 62
..	Ox Special Wheat and Corn Guano, manufactured by Tennesee Chemical Co., Nashville, Tenn	200	.85	9	3	1	1	15 38
..	Ox Bone with Ammonia and Potash, manufactured by Tennessee Chemical Co, Nashville, Tenn	200	.85	6	4	1	1	13 38
..	Ox Slaughter House Bone, manufactured by Tennessee Chemical Co., Nashville, Tenn	200	1.65	6	2	1	2	14 62
..	Ox H. G. Diss Bone, manufactured by Tennessee Chemical Co., Nashville, Tenn	200	......	8	6	1	.....	14 00
..	Ox Alkaline Bone, manufactured by Tennessee Chemical Co., Nashville, Tenn	200	....	9	3	1	2	14 00
..	Ox Bone and Potash, manufactured by Tennessee Chemical Co., Nashville, Tenn	200	....	7	5	1	1	13 00

..	Ox Potash Mixture, manufactured by Tennessee Chemical Co., Nashville, Tenn.	200	....	8	2	1	2	12 00
..	Ox Acid Phosphate, manufactured by Tennessee Chemical Co., Nashville Tenn.	200	....	7	5	1	.....	12 00
..	Ox Potash Acid, manufactured by Tennessee Chemical Co., Nashville. Tenn.	200	....	8	2	1	1	11 00
..	Ox Special Truck Guano, manufactured by Tennessee Chemical Co., Nashville, Tenn.	200	3.30	8	2	1	4	23 24
..	Complete Fertilizer, manufactured by Scholze Bros., Chattanooga, Tenn.	200	1.70	7	2	2	2	15 76
..	Truck Farmer's Friend, manufactured by Scholze Bros., Chattanooga, Tenn.	200	1.70	7	2	2	4	17 76
..	Acid Phosphate, manufactcred by Scholze Bros., Chattanooga, Tenn.	200	....	12	2	1	.....	14 00
..	Marietta H. G. Acid Phosphate, manufactured by Marietta Guano Co., Atlanta, Ga.	200	....	12–14	2–3	2–3		16 10
..	Marietta H. G. Acid Phosphate with Potash, manufactured by Marietta Guano Co., Atlanta, Ga.	200	....	8–10	2–3	2–3	1.25–2.25	13 13
..	Piedmont Acid Phosphate, manufactured by Marietta Guano Co., Atlanta Ga.	200	....	10–12	2–3	2–3	.....	13 80
..	Magic Cotton Grower, manufactured by Marietta Guano Co., Atlanta, Ga.	200	....	8–10	2–3	2–3	1–2	16 00
..	Beef Blood and Bone Compound, manufactured by Marietta Guano Co., Atlanta, Ga.	200	....	8–9	2–3	1–3	1.25–2 25	16 65
..	Disolved Bone with Potash, manufactured by Marietta Guano Co., Atlanta, Ga.	200	....	7–9	2–3	2–3	2–4	12 95
..	Same for Wheat, manufactured by Marietta Guano Co., Atlanta, Ga.	200	....	7–9	2–3	2–3	2–4	12 95
..	Wheat and Clover Grower, manufactured by Marietta Guano, Co., Atlanta, Ga	200	....	10–12	2–3	2–3	2–4	16 40
..	Golden Grain Grower, manufactured by Marietta Guano Co., Atlanta, Ga.	200	....	6–8	2–3	2–3	4–6	14 40
..	M. Y. C. H. G. Dis. Bone, manufactured by Marietta Guano Co., Atlanta, Ga	200	....	8–10	2–3	2–3	2–4	14 10

Guaranteed Analyses of Commercial Fertilizers, Filed in the Office of the Commissioner of Agriculture by Dealers and Manufacturers.

When Received.	Name of Fertilizer or Chemical, by Whom Manufactured, and Where Manufactured.	Weight of Package.	Guaranteed Analysis. Nitrogen.	Phosphoric Acid. Water Soluble.	Phosphoric Acid. Citrate Soluble.	Phosphoric Acid. Acid Soluble.	Potash.	Relative Commercial Value.
1900 Oct. 1	Planters Pride Guano, manufactured by Marietta Guano Co., Atlanta, Ga	200	1.75	7	2	1–3	1.25–2.25	17 50
..	Solid South Guano, manufactured by Marietta Guano Co., Atlanta, Ga	200	1.75	7	2	1–3	1.25–2.25	17 58
..	Lee Fertilizer, manufactured by Trawick & Jernigan, Opelika, Ala	200	1.75	8	1	2	2.00	15 90
..	XX Blood and Bone, manufactured by Trawick & Jernigan, Opelika, Ala	200	1.00	8	1	2	1.00	12 80
..	High Grade Guano, manufactured by Trawick & Jernigan, Opelika, Ala	200	1.50	7	2	2	1.75	14 95
..	Old Time Guano, manufactured by Trawick & Jernigan, Opelika, Ala	200	1.25	7	1	2	1.00	12 50
..	XXX Ammoniated Dissolv d Bone, manufacturedby Trawick & Jernigan, Opel'ka, Ala	200	.82	8	1	2	1.00	12 29
..	Dissolved Bone, manufactured by Trawick & Jernigan, Opelika, Ala	200	......	12	1	2	.....	13 00
..	Dissolved Bone and Potash, manufactured by Trawick & Jernigan, Opelika, Ala	200	......	10	2	2	1	13 00
..	Dissolved Bone and Potash, manufactured by Trawick & Jernigan, Opelika, Ala	200	......	10	2	1	1	12 00

..	Dissolved Bone and Potash, manufactured by Trawick & Jernigan, Opelika, Ala.	200	......	9	2	2	2	13 00
..	Dissolved Bone and Potash, manufactured by Trawick & Jernigan. Opelika, Ala.	200	......	9	1	2	2	12 00
..	Dissolved Bone and Potash, manufactured by Trawick & Jernigan. Opelika, Ala	200	......	9	1	2	3	13 00
..	Dissolved Bone and Potash manufactured by Trawick & Jernigan, Opelika, Ala.	200	......	8	1	2	3	12 00
..	H.G. English Acid, manufactured by Trawick & Jernigan, Opelika, Ala	200	......	12	2	2	2	14 00
..	Dissolved Bone, manufactured by Trawick & Jernigan, Opelika, Ala	200	......	11	1	2	......	12 00
..	Dale County Standard Fertilizer, manufactured by Ozark Cotton Seed Oil Mill Fertilizer Co., Ozark, Ala.	200	1.20	7	2	1	2	16 80
..	Ozark High Grade Fertilizer, manufactured by Ozark Cotton Seed Oil Mill Fertilizer Co Ozark, Ala	200	1.20	7	2	1	2	16 80
..	Complete Cotton Fertilizer, manufactured by Ozark Cotton Seed Oil Mill Fertilizer Co., Ozark, Ala	200	1.65	6	1.70	1	2	14 62
..	Ozark High Grade Phosphate, manufactured by Ozark Cotton Seed Oil Mill Fertilizer Co., Ozark, Ala	200	....	3	11	2	......	14 00
..	English Acid Phosphate, McDonald, imported by Troy Fertilizer Co., Troy, Ala.	200	......	11	3	.....	......	14 00
..	Blood and Bone, McDonald, imported by Troy Fertilizer Co. Troy, Ala.	200	1.65	7	2	....	2	15 62
..	English Dissolved Bone, Buford & Co. imported by Troy Fertilizer Co., Troy, Ala	200	......	11	3	.....	....	14 00
..	Dissolved Bone and Potash, manufactured by The Troy Fertilizer Co., Troy, Ala.	200	......	7	2	.....	8	12 00
..	Acid Phosphate and Potash, manufactured by The Troy Fertilizer Co., Troy, Ala.	200	......	7	2	.....	3	12 00
..	German Kainit, manufactured by The Troy Fertilizer Co. Troy, Ala.	200	......	......	......	....	12	12 00
..	The Troy Acid Phosphate, manufactured by The Troy Fertilizer Co., Troy, Ala.	200	......	10.50	2.50	.....	......	13 00

Guaranteed Analyses of Commercial Fertilizers, Filed in the Office of the Commissioner of Agriculture by Dealers and Manufacturers.

When Received.	Name of Fertilizer or Chemical, by Whom Manufactured, and Where Manufactured.	Weight of Package.	Guaranteed Analysis. Nitrogen.	Phosphoric Acid. Water Soluble.	Citrate Soluble.	Acid Soluble	Potash.	Relative Commercial Value.
1900 Oct. 1	H. G. Acid Phosphate, manufactured by the The Troy Fertilizer Co., Troy, Ala.	200	....	11	3	.....	....	$ 14 00
..	Pelican R. B Guano, manufactured by Standard G & C. Mfg. Co., New Orleans. La.	100–200	1.65–2.50	4–5	4–5		1.50–3	
..	Miss. Home Guano, manufactured by G. & G. Mfg. Co., New Orleans, La.	100–200	1.65–3.29	4–6.50	5–6.50		24.25	
..	Blood, Bone and Meat Guano, manufactured by Standard G. & C. Mfg. Co., New Orleans, La.	100–200	1.70–2.67	4-8	4.25–6.25	......	24.25	
..	Stern's Am. R. B. Sup. Phos, manufactured by Standard G, & C. Mfg Co, New Orleans, La.	100–200	1.65–2.50	4–5	5.00–5.50	......	1.50–3	
..	Standard Am. Sol. Guano, manufactured by Standard G. & C. Mfg Co., New Orleans, La.	100–200	1.65–3.50	4–5	4–5	.....	1.50–3	
..	Champion Farmers' Choice, manufactured by Standard G. & C, Mfg. Co., New Orleans, La.	100–200	1.65–2.50	4–5	4–5	......	1.50–3	
..	Ground Bone, manufactured by Standard G. & C. Mfg Co., New Orleans, La.	100–200	2.50–3.25	.....		18.50–21.00	......	
..	Dissolved Bone, manufactured by Standard G. & C. Mfg. Co., New Orleans, La.	100–200	....	13–14	2–5	.....	......	
.	Acid Phosphate, manufactured by Standard G. & C. Mfg. Co., New Orleans, La.	100–200	....	10–12	2–4	......	......	

..	Kainit, Manufactured by Standard G. & C. Manufacturing Co., New Orleans, La	100–200	....	......	......	.....	12–14	
..	Farmers Alliance, manufoctured by The Troy Fertilizer Company, Troy, Ala	200	1.65	7	2	.....	2	15 62
..	Blood and Bone, manufactured by The Troy Fertilizer Company, Troy, Ala	200	1.65	6.50	1.50	......	2	14 62
..	Dundee Guano, manufactured by The Troy Fertilizer Company. Troy, Ala	200	.82	8	2	......	1	13.30
..	Old Homestead, manufactured by The Troy Fertilizer Company, Troy, Ala	200	.82	8	2	....	1	13 30
..	Big Hit Guano, manufactured by The Troy Fertilizer Company, Troy, Ala	200	.82	8	2	.....	1	13 30
..	Troy Perfect, manufactured by The Troy Fertilizer Company. Troy, Ala	200	1.65	7	2	.....	2	15 62
..	Nancy Hanks, manufactured by The Troy Fertilizer Company, Troy, Ala	200	1.65	7	2	......	2	15 62
..	Meal Mixture, manufactured by The Troy Fertilizer Company, Troy, Ala	200	1.65	7	2	....	2	15 62
..	Hume's Am. Dissolved Bone, manufactured by The Troy Fertilizer Company, Troy, Ala	200	1.65	7	2	.....	2	15 62
..	Pike's Pride, manufactured by The Troy Fertilizer Company, Troy, Ala	200	1.65	7	2	.....	2	15 62
..	Soluble Blood and Bone Guano, manufactured by The Troy Fertilizer Company, Troy, Ala	200	.82	8	2	.....	1	13 30
..	Soluble Pacific Guano, manufactured by the Pacific Guano Co., Boston, Mass., and Charleston, S. C	200	1.75	6.50	2.00	2.00	1.00	14 40
..	Meridian Home Mixture, manufactured by Meridian Fertilizer Factory, Meridian Miss	200	1.65	7.50	1.50	.75	2.00	15 12
..	Meridian Blood and Bone, manufactured by Meridian Fertilizer Factory, Meridian, Miss	200	1.65	7.50	1.50	.75	2.00	15 12
..	Meridian Farmers' Friend, manufactured by Meridian Fertilizer Factory, Meridian, Miss	200	1.25	7.50	1.50	.75	1.00	13.12
..	Meridian Southern Phosphate, manufactured by Meridian Fertilizer Factory, Meridian, Miss	200	....	12.00	2.00	1.00	....	14 00

Guaranteed Analyses of Commercial Fertilizers, Filed in the Office of the Commissioner of Agriculture by Dealers and Manufacturers.

When Received.	Name of Fertilizer or Chemical, by Whom Manufactured, and Where Manufactured.	Weight of Package.	Guaranteed Analysis.					Relative Commercial Value.
				Phosphoric Acid.				
			Nitrogen.	Water Soluble.	Citrate Soluble	Acid Soluble	Potash.	
1900 Oct. 1	Meridian English Phos. manufactured by Meridian Fertilizer Factory, Meridian, Mississippi	200	....	8.00	2.00	1.00	....	$12 00
..	Bowker Cotton Fertilizer, manufactured by Bowker Fertilizer, Co., Elizabeth, N. J	200	1.65	6	2	2	1	14 62
..	Bowker Naston Guano, manufactured by Bowker Fertilizer Co., Elizabeth, N. J	200	1.65	6	2	2	1	14 62
..	Bowker Crown Guano, manufactured by Bowker Fertilizer Co., Elizabeth, N. J	200	1.65	6	2	2	1	14 62
..	Bowker Sure Crop Fertilizer, manufactured by Bowker Fert. Co., Elizabeth, N. J	200	1.65	6	2	2	1	14 62
..	Bowker Dis. Bone Phos., manufactured by Bowker Fert. Co., Elizabeth, N. J	200	....	10	2	2	.....	12 00
..	Bowker Dis. Bone with Potash, manufactured by Bowker Fert. Co., Elizabeth, N. J	200	....	8	2	2	2	12 00
..	Kainit, manufactured by Bowker Fertilizer Company, Elizabeth, N. J	....	....	.....	.....	.....	12	12 00
..	Ashepoo Fert., manufactured by Ashepoo Fertz. Co., Charleston, S. C	200	1.75	6 25	2.25	2 00	1.00	14 40
..	Eutaw Fertilizer, manufactured by Ashepoo Fertz. Co., Charleston, S. C	200	1.75	6.25	2.25	2 00	1.00	14 40

Oct. 1	Ashepoo Guano, manufacturad by Ashepoo Fertz. Co., Charleston, S. C	200	2.10	6.00	2.00	1.00	1.00	14 88
..	Eutaw Blood and Bone Guano, manufactured by Ashepoo Fertz. Co., Charleston, S. C	200	.85	6.00	2.00	3.00	1.00	11 38
..	Ashepoo Blood and Bone Guano, manufactured by Ashepoo Fertz Co., Charleston, S. C	200	.85	6.00	2.00	3.00	1.00	11.38
..	Ashepoo Dis. Bone with Am. and Potash, manufactured by Ashepoo Fertz. Co., Charleston, S. C	200	.85	6.00	2.00	3.00	1.00	11 38
..	Eutaw Guano, manufactured by Ashepoo Fertz. Co., Charleston, S. C	200	1.75	6.25	2.25	2.00	2.00	15 40
..	Enon Acid Phos., manufactured by Ashepoo Fertz. Co., Charleston, S. C	200	......	8.50	2.00	2.00	2.00	12 50
..	Pioneer Acid Phos,, manufactured by Ashepoo Fert.. Co., Charleston, S. C	200	......	8.50	2.00	2.00	1.00	11 50
..	Ashepoo Bone Ash, manufactured by Ashpoo Fertz. Co., Charleston, S. C	200	......	8.50	2.00	1.00	1.00	11.50
..	Ashepoo XX Acid Phos., manufactured by Ashepoo Fertz. Co., Charleston, S. C	200	......	9.50	2.50	2.00	......	12 00
..	Eutaw XX Acid Phos., manufactured by Ashepoo Fertz Co., Charleston, S. C	200	......	9.50	2.50	2.00	......	12 00
..	Bronwood Acid Phos., manufactured by Ashepoo Fertz. Co., Charleston, S. C	200	......	6.00	2.00	2.00	4.00	12 00
..	Eutaw Acid with Potash, manufactured by Ashepoo Fertz. Co., Charleston, S. C	200	......	8.50	2 00	2.00	1.00	11 50
..	German Kainit, manufactured by Ashepoo Fertz. Co., Charleston, S C.	200	......	......	......	......	11.00	11 00
..	Carolina Acid Phos., manufactured by Ashepoo Fertz. Co., Charleston, S. C.	200	......	6.00	2.00	2.00	4.00	12 00
..	Coomassie A. P. with Potash, manufactured by Ashepoo Fertz. Co., Charleston, S C	200	......	9.50	2.50	1.00	2 00	14 00
..	Ashepoo Acid Phos. with Potash, manufactured by Ashepoo Fertz Co., Charleston, S. C.	200	......	8.50	2.00	2.00	1.00	11 50
..	Ashepoo Acid Poash, manufactured by Ashepoo Fertz. Co., Charleston, S. C	200	......	8.50	2.00	1.00	......	10 50

Guaranteed Analyses of Commercial Fertilizers, Filed in the Office of the Commissioner of Agriculture by Dealers and Manufacturers—Continued.

When Received.	Name of Fertilizer or Chemical, by Whom Manufactured, and Where Manufactured.	Weight of Package.	Guaranteed Analysis.					Relative Commercial Value.
			Nitrogen.	Phosphoric Acid.			Potash.	
				Water Soluble,	Citrate Soluble.	Acid Soluble.		
1900 Oct. 1	[illegible] Acid Phosphate, manufactured by Ashepoo Fertilizer Co., Charleston, S. C	200	......	8.50	2 00	1.00	....	10 50
..	Coomassie Acid Phosphate, manufactured by Ashepoo Fertilizer Co, Charleston, S. C	200	...	9.50	2.50	2.00	....	12 00
..	Blood and Bone and Potash, manufactured by New Orleans Acid and Chemical Co., New Orleans, La	200	.823	7.00	3	2	1	13 30
..	Acid Phosphate with 4% Potash, manufactured by Potapsco Guano Co., Baltimore, Md.	200		5.00	3	2	4	12 00
..	Ammoniated Dissolved Bone and Potash, manufactured by Dothan Guano Co, Dothan, Ala	200	.823	8.00	2	2	2	14 30
..	Standard Grade Corn and Cotton Compo., manufactured by Dothan Guano Co., Dothan, Ala	200	1.65	7.00	2	1	2	15 62
..	Standard Grade Grange Mixture, manufactured by Dothan Guano Co., Dothan, Ala	200	1.65	5.50	2	1	3	15 12
..	Peterman's Leader, manufactured by Dothan Guano Co., Dothan. Ala	200	.82	8 00	2	1	1	13 30
..	Grange Mixture, manufactured by Dothan Guano Company, Dothan, Ala	200	1.65	5.50	1 25	1	3	14 37
..	Corn and Cotton Compound, manufactured by Dothan Guano Co., Dothan, Ala.	200	1.65	7.00	1.00	1	2	14 62

..	Howell's Fruit Food, manufactured by Dothan Guano Company, Dothan, Ala	200	1.50	5.50	2.00	1	3.1-2	15 20
..	Phosphate with 3% Potash, manufactured by Dothan Guano Co, Dothan, Ala	200	....	8.00	1.50	1	3	12 50
..	High Grade Acid Phosphate, manufactured by Dothan Guano Co. Dothan, Ala	200	....	11.00	2.00	1	.....	13 00
..	Blood and Bone Fertilizer manufactured by Dothan Guano Co, Dothan, Ala	200	1.65	7.00	2.00	1	2	15 62
..	Ammoniated Dissolved Bone, manufactured by Dothan Guano Co., Dothan, Ala	200	.82	8.00	2.00	1	1	13 30
..	Genuine German Kainit, manufactured by Dothan Guano Co., Dothan, Ala	200	....	......	......	.....	12%	12 00
..	B. D. Seafowl Guano, manufactured by Bradley Fertilizer Co., Charleston, S. C	200	1.85	6.50	2.50	2.00	1.00	15 18
..	Bradley's Patent Superphosphate, manufactured by Bradley Fertilizer Co., Charleston, S C	200	1.85	6.50	2.50	2.00	1.00	15 18
..	Ammoniated Dissolved Bone, manufactured by Bradley Fertilizer Co, Charleston, S. C	200	1.65	6.00	2.00	2.00	1.00	13 62
..	Eagle Am. Bone Superphosphate, manufactured by Bradley Fertilizer Co., Charleston, S. C	200	1.65	6 00	2.00	2.00	1.00	13 62
..	Bradley's Palmetto Acid Phosphate manufactured by Bradley Fertilizer Co., Charleston, S. C	200	....	9.00	3 00	2 00	.....	12 00
..	Cow Phosphate Acid, manufactured by Cullman Cotton Company, Cullman, Ala	200	....	12-13	1-2	2-3	......	13 00
..	Bull Phosphate Acid, manufactured by Cullman Cotton Company, Cullman, Ala	200	....	12-14	2-4	1-2	......	11 00
..	Corn and Cotton Guano, manufactured by Cullman Cotton Co., Cullman, Ala	200	.82-100-1	......	......	10-11	1.1-15	13 30
..	Cow Guano, manufactured by Cullman Cotton Company, Cullman, Ala	200	1.65-2	.....	......	10-12	1.1-15	15 62
..	Guano No. 8—P., manufactured by Cullman Cotton Company, Cullman, Ala	200	....	8	2	...	4	14 00
..	Guano No. 8—S., manufactured by Cullman Cotton Company, Cullman, Ala	200	1.65	6	2	......	2	14 62

Guaranteed Analyses of Commercial Fertilizers, Filed in the Office of the Commissioner of Agriculture, by Dealers and Manufacturers.

When Received.	Name of Fertilize. or Chemical, by Whom Manufactured, and Where Manufactured.	Weight of Package	Guaranteed Analysis. Nitrogen.	Phosphoric Acid. Water Soluble.	Phosphoric Acid. Citrate Soluble.	Phosphoric Acid. Acid Soluble.	Potash.	Relative Commercial Value
1900 Oct. 1	Best Made, manufactured by Cullman Cotton Co., Cullman, Ala	200	1.65	8	2	1.17	2	$16 62
..	Cow Cotton Guano, manufactured by Cullman Cotton Co., Cullman, Ala	200	1.65	8.21	1.79	1.32	1	15 62
..	Corn and Cotton Guano, manufactured by Cullman Cotton Co., Cullman, Ala	200	.82	7.35	2.65	1.83	1	13 80
..	Cow Acid Phosphate, manufactured by Cullman Cotton Co, Cullman, Ala	200	......	12%	1%	2%	....	15 00
..	Bull Acid Phosphate, manufactured by Cullman Cotton Co., Cullman, Ala	200	......	12%	2%	1%	....	14 00
..	No. 5 B Phosphate, manufactured by Cullman Cotton Co., Cullman, Ala	200	1.65	7	2	....	2	15 62
..	No. 6 A., manufactured by Cullman Cotton Co., Cullman, Ala	200	1.50	7	2	....	2	15 20
..	No. 9 C., manufactured by Cullman Cotton Co., Cullman, Ala	200	1.65	8	2	....	1	15 62
..	Guano 16. P., manufactured by Cullman Cotton Co., Cullman, Ala	200	.....	12	.....	.....	4	16 00
..	Mountain City Lint, manufactured by Cullman Cotton Co., Cullman, Ala	200	.82	6	4	1	4	16 30

Oct. 1	Mountain City Lint, No. 2, manufactured by Cullman Cotton Co., Cullman, Ala	200	1.65	6	4	1	4	18 60
..	Corn and Cotton Lint No. 2, manufactured by Cullman Cotton Co., Cullman, Ala	200	1 65	10	2	......	2	16 60
..	No. 1024, manufactured by Cullman Cotton Co., Cullman, Ala	200	1.65	8	2	1	4	18 60
..	No. 735, manufactured by Cullman Cotton Co., Cullman, Ala	200	2.50	6	1	1	5	19 00
..	No. 1034, manufactured by Cullman Cotton Co., Cullman, Ala	200	2.50	8	2	1	4	21 00
..	No. 1023, manufactured by Cullman Cotton Co., Cullman, Ala	200	1.65	8	2	1	3	17 62
..	No. 823, manufactured by Cullman Cotton Co., Cullman, Ala	200	1.65	6	2	1	3	15 62
..	No. 822, manufactured by Cullman Cotton Co., Cullman, Ala	200	1 65	6	2	1	2	14 62
..	No. 1022, manufactured by Cullman Cotton Co., Cullman, Ala	200	1.65	8	2	1	2	19 62
..	No. 922, manufactured by Cullman Cotton Co., Cullman, Ala	200	1 65	7	1.50	1	2	15 12
..	No. 1021, manufactured by Cullman Cotton Co., Cullman, Ala	200	1.65	8	2	1	1	15 62
..	No. 1014, manufactured by Cullman Cotton Co., Cullman, Ala	200	.82	8	2	1	4	16.30
..	Acid and Potash No. 2, manufactured by Home Mixture Guano Co., Columbus, Ga	200	....	8	2	2	2	12 00
..	Acid and Potash No. 12–2, manufactured by Home Mixture Guano Co., Columbus, Ga	200	....	8	4	2	2	14 00
..	Acid and Potash No. 4, manufactured by Home Mixture Guano Co., Columbus, Ga	200	....	6	2	2	4	12 00
..	Home Mixture No 1, manufactured by Home Mixture Guano Co., Columbus, Ga	200	1.65	7	2	2	1	14 62
..	Home Mixture No. 2, manufactured by Home Mixture Guano Co., Columbus, Ga	200	1.65	6	2	2	2	14 62

Guaranteed Analyses of Commercial Fertilizers, Filed in the office of the Commissioner of Agriculture by Dealers and Manufacturers.

When Received.	Name of Fertilizer or Chemical, by Whom Manufactured, and Where Manufactured.	Weight of Package	Guaranteed Analyses					Relative Commercial Value.
				Phosphoric Acid.				
			Nitrogen.	Water Soluble.	Citrate Soluble.	Acid Soluble.	Potash.	
1900 Oct. 1	Home Mixture No 3, manufactured by Home Mixture Guano Co., Columbus, Ga.	200	1.65	8	2	2	2	$ 16 62
..	Home Mixture No 4, manufactured by Home Mixture Guano Co, Columbus, Ga.	200	1.65	6	2	2	4	16 62
..	Acid Phosphate No. 1, manufactured by Home Mixture Guano Co., Columbus, Ga.	200	......	10	2	2	......	12 00
..	Acid Phosphate No. 2, manufactured by Home Mixture Guano Co., Columbus, Ga.	200	......	12	2	2	....	14 00
..	Potatoe Mixture, manufactured by Home Mixture Guano Co., Columbus, Ga.	200	1.65	4	2	1	6	16 62
..	Kainit, manufactured by Home Mixture Guano Co., Columbus, Ga.	200	....	....	....	....	12	12 00
..	Goldsmith Imported Mixture, manufactured by New Orleans Acid and Fertilizer Co., Gretna, La.	200	1.65	7.00	2.00	2.00	1.00	14 62
..	Gold Dust, manufactured by New Orleans Acid and Fertilizer Co., Greta, La.	200	1.65	7.00	2.00	2.00	1.00	14 62
..	Blood, Bone and Potash, manufactured by New Orleans Acid and Fertilizer Co., Gretna, La.	200	1.65	7.00	2.00	2.00	1.00	14 62
..	Good Luck, manufactured by New Orleans Acid and Fertilizer Co., Gretna, La.	200	1.65	7.00	2.00	2.00	1.00	14 62

..	Dixie Soluble Bone and Potash with Ammonia, manufactured by New Orleans Acid and Fertilizer Co., Gretna, La.	200	1.65	6.00	1.00	2.00	1.00	12 62
..	Diss. Bone and Potash, manufactured by New Orleans Acid and Fertilizer Co., Gretna, La.	200	....	8.00	2.00	2.00	2 00	12 00
..	Acid and Potash, manufactured by New Orleans Acid and Fertilizer Co., Gretna, La	200	......	8.00	2.00	2.00	4.00	14 00
..	Black Diamond Acid Phosphate, manufactured by New Orleans Acid and Fertilizer Co., Gretna, La	200	.....	10.00	2.00	2.00	....	12 00
..	Crescent City Acid Phosphate, manufactured by New Orleans Acid and Fertilizer Co., Gretna, La.	200	.....	10.00	2.00	2.00	.....	12 00
..	W. O. C. A. Pure Blood Guano, manufactured by Coweta Fertilizer Co., Newnan and Columbus, Ga.	167	1.65	8	2	1	2	16 62
..	Coweta H. G. Fertilizer. manufactured by Coweta Fertilizer Co., Branch Virginia-Carolina Chemical Co., Newnan, Ga.	200	1.65	8	2	1	2	16 62
..	Coweta Animal Bone, manufactured by Coweta Fertilizer Co., Branch Virginia-Carolina Chemical Co., Newnan, Ga.	200	1.65	6	2	1	2	14 62
..	Sea Bird Guano manufactured by Coweta Fertilizer Co., Branch Virginia-Carolina Chemical Co. Newnan, Ga.	200	1.65	6	2	1	2	14 62
..	Aurora Amo. Phosphate, manufactured by Coweta Fertilizer Co., Branch Virginia-Carolina Chemical Co., Newnan, Ga.	200	1.65	7	2	1	1	14 62
..	Coweta Stand. Dis. Bone and Potash, manufactured by Coweta Fert. Co., Branch Virginia-Carolina Chemical Co., Newnan, Ga.	200	......	8	2	1	2	12 00
..	Coweta Wheat and Grass Grower, manufactured by Coweta Fert. Co., Branch Virginia-Carolina Chemical Co., Newnan, Ga.	200	....	8	2	1	2	12 00
..	Coweta H. G. Acid Phosphate, manufactured by Coweta Fert. Co., Branch Virginia-Carolina Chemical Co., Newnan, Ga.	200	......	12	2	1	......	14 00
..	Coweta Standard Acid Phosphate, manufactured by Coweta Fert. Co., Branch Virginia-Carolina Chemical Co., Newnan, Ga.	200	.....	10	2	1	.....	12 00
..	Coweta Diss. Bone, manufactured by Coweta Fertilizer Co., Branch Virginia-Carolina Chemical Co., Newnan, Ga.	200	......	10	2	1	......	12 00
..	I. A. P. Bone with Amonia and Potash, manufactured by Coweta Chemical Co., Branch Virginia-Car Chemical Co., Newnan, Ga.	200	.83	8	2	1	1	13 31
..	13 & 14 Diss. Bone and Potash, manufactured by Coweta Fert. Co., Branch Virginia-Carolina Chemical Co., Newnan, Ga.	200	....	11	2	1	4	17 00

Guaranteed Analyses of Commercial Fertilizers, Filed in the Office of the Commissioner of Agriculture by Dealers and Manufacturers.

When Received.	Name of Fertilizer or Chemical, by Whom Manufactured, and Where Manufactured.	Weight of Package.	Guaranteed Analysis. Nitrogen.	Phosphoric Acid. Water Soluble.	Phosphoric Acid. Citrate Soluble.	Phosphoric Acid. Acid Soluble.	Potash.	Relative Commercial Value.
1900 Oct. 1	10 & 4 Dissolved Bone and Potash, manufactured by Coweta Fert. Co., branch Virginia-Carolina Chemical Co., Newnan, Ga	200	....	8	2	1	4	$ 14 00
..	8 & 4 Dissolved Bone and Potash, manufactured by Coweta Fert. Co., branch Virginia-Carolina Chemical Co., Newnan, Ga	200	....	6	2	1	4	12 00
..	Coweta Dissolved Bone and Potash, manufactured by Coweta Fert. Co., branch Virginia-Carolina Chemical Co., Newnan, Ga	200	....	10	2	1	2	14 00
..	German Kainit, manufactured by Coweta Fert. Co., branch Virginia-Carolina Chemical Co., Newnan, Ga	200	....	......	......	.....	12	12 00
..	Muriate of Potash, manufactured by Coweta Fert. Co., branch Virginia-Carolina Chemical Co., Newnan, Ga	....	...	....	......	....	48	48 00
..	Old Dominion Guano, manufactured by Old Dominion Guano Co., Atlanta, Ga	200	1.65	6	2	2	1.50	14 12
..	Southern Amd. Dissolved Bone Guano, manufactured by Old Dominion Guano Co., Atlanta, Ga	200	1 65	6	2	2	1	13 62
..	Patent Pacific Guano, manufactured by Old Dominion Guano Co., Atlanta, Ga	200	1.65	6	2	2	1	13 62
..	Etowah Guano, manufactured by Old Dominion Guano Co, Atlanta, Ga	200	.85	6	3	2	1	12 38
..	Blood and Bone Guano, manufactured by Old Dominion Guano Co., Atlanta, Ga	200	.85	6	3	2	1	12 38

..	Old Dominion Dissolved Bone, manufactured by Old Dominion Guano Co, Atlanta, Ga	200	....	10	2	2	......	12 00
..	Old Dominion Dissolved Bone and Potash, manufactured by Old Dominion, Guano Co., Atlanta, Ga	200	....	8	2	2	2	12 00
..	Old Dominion Dissolved Bone and Potash, manufactured by Old Dominion Guano Co., Atlanta Ga	200	....	6	2	2	4	12 00
..	Old Dominion Dissolved Bone and Potash, manufactured by Old Dominion Guano Co , Atlanta, Ga	200	....	8	2	2	4	14 00
..	Bear H. G. Dissolved Bone, manufactured by Continental Fertilizer Co,, Nashville, Tenn	200	....	8	6	1	......	14 00
..	Bear H. G. Beef Blood and Bone, manufactured by Continental Fertilizer Co . Nashville, Tenn	200	1.65	8	2	1	2	16 62
..	Bear Special Wheat and Corn Grower, manufactured by Continental Fertilizer Co , Nashville, Tenn	200	....	8	3	1	2	13 00
..	Bear Bone and Potash, manufactured by Continental Fertilizer Co., Nashville, Tenn	200	......	9	3	1	1	13 00
..	Bear Potash mixture, manufactured by Continental Fertilizer Co , Nashville, Tenn	200	....	8	2	1	2	12 00
..	Eddystone Soluble Guano, manufactured by Continental Fertilizer Co., Nashville, Tenn	200	1.65	7	2	1	1	14 62
..	Eddystone Dissolved Bone, manufactured by Continental Fertilizer Co., Nashville, Tenn	200	....	10	3	1	.....	13 00
..	Eddystone Bone and Potash, manufactured by Continental Fertilizer Co., Nashville, Tenn	200	....	7	5	1	1	13 00
..	Eddystone Potash Mixture, manufactured by Continental Fertilizer Co., Nashville, Tenn	200	.....	7	3	1	2	12 00
..	Sunny South Acid Phosphate, manufactured by Continental Fertilizer Co., Nashville, Tenn	200	....	10	3	1	......	13 00
..	Bear Phosphate and Potash, manufactured by Continental Fertilizer Co., Nashville, Tenn	200	....	8	2	1	1	11 00
..	Eddystone Cotton Guano, manufactured by Continental Fertilizer Co., Nashville, Tenn	200	.85	6	4	1	1	13 38
..	Etiwan H. G. Acid Phosphate, manufactured by Etiwan Fertilizer Co., Charleston, S. C	200	....	11–13	2–3	2	......	13 00

Guaranteed Analyses of Commercial Fertilizers, Filed in the Office of the Commissioner of Agriculture by Dealers and Manufacturers.

When Received.	Name of Fertilizer or Chemical, by Whom Manufactured, and Where Manufactured.	Weight of Package.	Guaranteed Analysis. Nitrogen.	Phosphoric Acid. Water Soluble	Citrate Soluble.	Acid Soluble.	Potash.	Relative Commercial Value.
1900 Oct. 1	Etiwan Acid Phosphate, manufactured by Etiwan Fertilizer Co., Charleston, S. C.	200	......	10–12	2	2	.....	12 00
..	Plow Brand Raw Bone Superphosphate, manufactured by Etiwan Fertilizer Co., Charleston, S. C.	200	1.64	6–8	2–3	2	2–3	14 60
..	Diamond Soluble Bone, manufactured by Etiwan Fertilizer Co., Charleston, S. C.	200	....	11–13	2–3	2	.....	13 00
..	Plow Brand Soluble Fertilizer, manufactured by Etiwan Fertilizer Co., Charleston, S. C.	200	1.64	7–9	2–3	2	1–2	14 60
..	American Ammoniated Bone Superphosphate, manufactured by Williams & Clark Fertilizer Co., Charleston, S. C.	200	1.65	6.00	2.00	2.00	1.00	13 62
..	Cumberland Bone Superphosphate of Lime, manufactured by Cumberland Bone Phosphate Co., Charleston, S. C.	200	1.65	6.00	2.00	2.00	1.00	13 62
..	Goulding's Vegetable Compound, manufactured by The Goulding Fertilizer Co. Limited, Pensacola, Fla.	200	3.30	5	2	1	4	20 24
..	Goulding's H. G. Acid Phosphate, manufactured by The Goulding Fertilizer Co. Limited, Pensacola, Fla.	200	....	12	3	1	.....	15 00
..	Goulding's Atlas Acid Phosphate, manufactured by The Goulding Fertilizer Co., Limited, Pensacola, Fla.	209	....	10	3	1	....	13 00
..	Goulding's Mixture, manufactured by The Goulding Fertilizer Co., Limited, Pensacola, Fla.	200	....	10	2	1	.....	14 00

..	Genuine German Kainit, manufactured by The Goulding Fertilizer Co., Limited, Pensacola, Fla.	200	....	.....	....	.....	12	12 00
..	Goulding's H. G. Phosphate and Potash, manufactured by The Goulding Fertilizer Co., Limited, Pensacola, Fla.	200	....	10	2	1	1	13 00
..	Goulding's Bone Compound, manufactured by The Goulding Fertilizer Co., Limited, Pensacola, Fla	200	1.65	6	3	1	1.50	15 12
..	Goulding's Special Compound, manufactured by The Goulding Fertilizer Co., Limited, Pensacola, Fla.	200	1.65	6	3	1	1.50	15 12
..	Goulding's Ammoniated Bone, manufactured by The Goulding Fertilizer Co., Limited, Pensacola, Fla.	200	1.65	6	3	1	1.50	15 12
..	Goulding's English Bone Compound, manufactured by The Goulding Fertilize Co, Limited, Pensacola, Fla.	200	1 65	6	3	1	1.50	15 12
..	Goulding's St. George Guano, manufactured by The Goulding Fertilizer Co., Limited, Pensacola, Fla.	200	.85	7	2	1	1.50	12 38
..	Winkler H. G. Acid Phosphate, manufactured by The Goulding Fertilizer Co., Limited, Pensacola, Fla.	200	....	12	3	1	....	15 00
..	A. G. Winkler's Ammoniated Dissolved Bone, manufactured by The Goulding Fertilizer Co., Limited, Pensacola. Fla.	200	1.65	6	3	1	1.50	15 12
..	Gem Guano, manufactured by The Goulding Fertilizer Co, Limited, Pensacola, Fla	200	1.65	5	3	1	2	14 62
..	English Acid Phosphate, manufactured by The Goulding Fertilizer Co., Limited, Pensacola Fla.	200	....	9	3	1	1.50	12 00
..	Samson Ammoniated Bone, manufactured by The Goulding Fertilizer Co., Limited, Pensacola, Fla.	200	1.65	6	3	1	1.50	15 12
..	Samson Acid Phosphate, manufactured by The Goulding Fertilizer Co., Limited, Pensacola, Fla.	200	....	10	3	1	....	13 00
..	Goulding's 3% Potash Acid, manufactured by The Goulding Fertilizer Co. Limited, Pensacola, Fla.	200	...	6	2	1	3	11 00
..	Goulding's 4% Potash Acid, manufactured by The Goulding Fertilizer Co., Limited, Pensacola, Fla.	200	....	6	2	1	4	12 00
..	Goulding's XXX Potash Acid, manufactured by The Goulding Fertilizer Co., Limited. Pensacola, Fla.	200	....	12	2	1	2	16 00
..	Tucker, Willinghanm & Co's Special H. G. Potash Guano, manufactured by The Goulding Fertilizer Co., Limited, Pensacola, Fla.	200	.85	7	3	1	3	15 88

Guaranteed Analyses of Commercial Fertilizers, Filed in the Office of the Commissioner of Agriculture by Dealers and Manufacturers.

When Received.	Name of Fertilizer or Chemical, by Whom Manufactured, and Where Manufactured.	Weight of Package.	Guaranteed Analysis.					Relative Commercial Value.
			Nitrogen.	Phosphoric Acid.			Potash.	
				Water Soluble.	Citrate Soluble.	Acid Soluble.		
1900 Oct. 1	Earle Terrell & Co. H. G. Fertilizer, manufactured by Birmingham Fertilizer Co., Birmingham, Ala	200	1.64-2.46	8-10	2-3	2	2-3	16 60
..	Earle Terrell & Co. H G. Acid Phosphate, manufactured by Birmingham Fertilizer Co., Birmingham, Ala	200	......	11-13	2-3	2	.....	13 00
..	Earle Terrell & Co. Bone and Potash, manufactured by Birmingham Fertilizer Co.. Birmingham, Ala	200	......	8-10	2-3	2	2-3	12 00
..	Dadeville Oil Mill H. G. Acid Phosphate, manufactured by Birmingham Fertilizer Co, Birmingham, Ala	200	......	10-12	2-3	2	..	12 00
..	Cahaba Acid Phos. and Pot Mixture, manufactured by Birmingham Fertilizer Co., Birmingham, Ala	200	......	8-10	2-3	2	2-3	12 00
..	Cahaba Potash Bone, manufactured by Birmingham Fertilizer Co., Birmingham, Ala	200	......	8-10	2-3	2	4-5	14 00
..	Cahaba Bone Ash, manufactured by Birmingham Fertilizer Co., Birmingham, Ala	200	......	6-8	2-3	2	4-5	12 00
..	Cahaba Soluble Bone, manufactured by Birmingham Fertilizer Co., Birmingham, Ala	200	......	6-8	2-3	2	1-2	11 30
..	Cahaba Dis. Bone Am. and Potash, manufactured by Birmingham Fertilizer Co., Birmingham, Ala	200	......	8-10	2-3	2	1-2	13 30
..	Cahaba H. G. Blood, Bone and Potash, manufactured by Birmingham Fertilizer Co., Birmingham, Ala	200	1.64-2.46	8-10	2-3	2	2-3	16 60

..	Cahaba H. G. Fertilizer, manufactured by Birmingham Fertilizer Co., Birmingham, Ala	200	1.64-2.46	8-10	2-3	2	2-3	16 60
..	Cahaba Soluble Guano, manufactured by Birmingham Fertilizer Co., Birmingham, Ala	200	1.64-2.46	7-9	2-3	2	1-2	14 30
..	Cahaba Standard Grade Fertilizer, manufactured by Birmingham Fertilizer Co., Birmingham, Ala	200	1.64-2.46	7-9	2-3	2	1-2	14 60
..	Birmingham H. G. Blood, Bone and Potash, manufactured by Birmingham Fertilizer Co., Birmingham, Ala	200	1.64-2.46	8-10	2-3	2	2-3	16 60
..	Birmingham H. G. Fertilizer, manufactured by Birmingham Fertilizer Co., Birmingham, Ala	200	1.64-2.46	8-10	2-3	2	2-3	16 60
..	Birmingham Soluble Guano, manufactured by Birmingham Fertilizer Co., Birmingham, Ala	200	1.64-2.46	7-9	2-3	2	1-2	14 60
..	Birmingham Standard Grade Fertilizer, manufactured by Birmingham Fertilizer Co., Birmingam, Ala	200	1.64-2 46	6-8	2-3	2	2-3	14 60
..	Birmingham Dis. Bone A. M. and Potash, manufactured by Birmingham Fertilizer Co., Birmingham, Ala	200	.82-100	8-10	2-3	2	1-2	13 30
..	Jefferson County Standard Guano, manufactured by Birmingham Fertilizer Co., Birmingham, Ala	200	1.64-2.46	8-10	2-3	2	2-3	16 60
..	Cahaba Acid Phosphate, manufactured by Birmingham Fertilizer Co., Birmingham, Ala	200	....	10-12	2-3	2	....	12 00
..	Cahaba H. G. Acid Phosphate, manufactured by Birmingham Fertilizer Co., Birmingham, Ala	200	....	11-13	2-3	2	...	13 00
..	Cahaba Dissolved Bone, manufactured by Birmingham Fertilizer Co., Birmingham, Ala	200	....	10-12	2-3	2	...	12 00
..	Cahaba H. G. Diss. Bone, manufactured by Birmingham Fertilizer Co., Birmingham, Ala	200	....	11-13	2-3	2	...	13 00
..	Cahaba Acid Phosphate with Potash, manufactured by Birmingham Fertilizer Co., Birmingham, Ala	200	....	8-10	2-3	2	1-2	11 00
..	Birmingham Acid Phosphate, manufactured by Birmingham Fertilizer Co., Birmingham, Ala	200	....	10-12	2-3	2	....	12 00
..	Birmingham H. G. Acid Phosphate, manufactured by Birmingham Fertilizer Co., Birmingham, Ala	200	....	11-13	2-3	2	...	13 00
..	Birmingham Dissolved Bone, manufactured by Birmingham Fertilizer Co., Birmingham, Ala	200	....	10-12	2-3	2	...	12 00

Guaranteed Analyses of Commercial Fertilizers, Filed in the Office of the Commissioner of Agriculture by Dealers and Manufacturers—Continued.

When Received.	Name of Fertilizer or Chemical, by Whom Manufactured, and Where Manufactured.	Weight of Package.	Guaranteed Analysis.					Relative Commercial Value.
			Nitrogen.	Phosphoric Acid.			Potash.	
				Water Soluble	Citrate Soluble.	Acid Soluble.		
1900 Oct. 1	Birmingham H. G. Dissolved Bone, manufactured by Birmingham, Fertilizer Co., Birmingham, Ala.	200	......	11–13	2–3	2	....	$ 13 00
..	Birmingham Acid Phosphate with Potash, manufactured by Birmingham Fertilizer Co., Birmingham, Ala....	200	......	8–10	2–3	2	1–2	11 00
..	Birmingham Acid Phosphate and Potash mixture, manufactured by Birmingham Fertilizer Co., Birmingham, Ala	200	......	8–10	2–3	2	2–3	12 00
..	Birmingham Potash Bone, manufactured by Birmingham Fertilizer Co., Birmingham, Ala.	200	......	8–10	2–3	2	4–5	14 00
..	Birminghham Bone and Ash, manufactured by Birmingham Fertilizer Co., Birmingham, Ala.	200	......	6–8	2–3	2	4–5	12 00
..	Birmingham D Bone and Muriate Potash mixture, manufactured by Birmingham Fertilizer Co., Birmingham, Ala.	200	......	10–12	2–3	2	2–3	14 00
..	Birmingham Soluble Bone, manufactured by Birmingham Fertilizer Co., Birmingham, Ala.	200	82–100	6–8	2–3	2	1–2	11 30
..	Navassa Cotton Fertilizer, manufactured by Navassa Guano Co, Wilminghton, N. C	200	1 65	6 00	2.00	2 00	2.00	14 62
..	Navassa Bone and Ash, manufactured by Navassa Guano Co, Wilmington, N. C.	200	...	7.00	3.00	2.00	2.00	12 00
..	Dissolved Bone with Am. and Potash, manufactured by Navassa Guano Co,, Wilmington, N. C.	2 00	.82	7.00	3.00	2.00	1.00	13 30

..	Navassa Acid Phosphate, manufactured by Navassa Guano Co., Wilmington, N. C	200	......	9.00	3.00	2.00	...	12 00
..	Acid Phosphate with Potash, manufactured by Navassa Guano Co., Wilmington, N. C	200	....	7.00	3.00	2.00	1.00	11 00
..	Navassa Complete Fertilizer, manufactured by Navassa Guano Co., Wilmington, N. C	200	1.65	6.00	3.00	2.00	1.00	14 62
..	Navassa Wheat Mixture, manufactured by Navassa Guano Co., Wilmington, N. C	200	....	7.00	3.00	2.00	4.00	14 00
..	Navassa Grain Fertilizer, manufactured by Navassa Guano Co., Wilmington, N. C	200	1.65	6.00	2.00	2.00	2.00	14 62
..	Genuine German Kainit, manufactured by Navassa Guano Co., Wilmington, N. C	200	....	......	....	....	12.00	12 00
..	Giant Guano, manufactured by Rasin Monumental Co., Richmond, Va	200	1.65	6	2	2	2	14 62
..	Soluble Sea Island, manufactured by Rasin Monumental Co., Charleston, S. C	200	1.65	6	3	2	1	14 62
..	Rasin's Empire Guano, manufactured by Rasin Monumental Co., Atlanta, Ga	200	1.65	6	3	2	1	14 62
..	Rasin's Dixie Guano, manufactured by Rasin Monumental Co., Atlanta, Ga	200	1.65	6	2	2	2	14 62
..	Kainit, manufactured by Rasin Monumental Company, Atlanta, Ga	200	....	......	......	.....	12	12 00
..	Acid Phosphate, manufactured by Rasin Monumental Company, Atlanta, Ga	200	....	10	4	2	......	14 00
..	Bone and Potash, manufactured by Rasin Monumental Co., Atlanta, Ga	200	......	7	3	2	2	12 00
..	Dissolved Bone, manufactured by Rasin Monumental Company, Atlanta, Ga	200	1.65	7	3	2	...	14 62
..	Columbia Guano, manufactured by Columbia Fertilizer Co., Columbia, Ala	200	1.65	6	1	1	2	16 12
..	Farmer's Friend, manufactured by Columbia Fertilizer Company, Columbia, Ala	200	1 00	6	1	1	3	15 00
..	Columbia G. Acid Phos., m'f'd by Col. Fert. Co., Columbia, Ala	200	......	10	2	1	.....	13 00
..	Dis. Bone and Potash, m'f'd by Col. Fert. Co., Columbia, Ala	200	...	6	2	1	3	13 00

Guaranteed Analyses of Commercial Fertilizers, Filed in the office of the Commissioner of Agriculture by Dealers and Manufacturers.

When Receivek.	Name of Fertilizer or Chemical, by Whom Manufactured, and Where Manufactured.	Weight of Package.	Guaranteed Analysis.					Relative Commercial Value.
				Phosphoric Acid.				
			Nitrogen.	Water Soluble.	Citrate Soluble.	Acid Soluble.	Potash.	
1900 Oct. 1	German Kainit, manufactured by Columbia Fertilizer Co., Columbia, Ala.	200	......	......	......	......	12	$ 12 00
..	Sipsey H. G. Acid Phosphate, manufactured by Gadsden C. S. Oil Co., Gadsden, Ala	200	......	11	2	1	......	13 00
..	Sipsey H. G. Acid Phos. and Potash, manufactured by Gadsden C. S. Oil Co., Gadsden, Ala.	200	......	9	1	1	2	12 00
..	Graham's Best Guano, manufactured by Gadsden C. S. Oil Co., Gadsden, Ala.	200	2	7	2	1	2	16 60
..	Etowah Fertilizer, manufactured by Gadsden C. S. Oil Co., Gadsden, Ala.	200	1	9	1	1	1	13 80
..	King Cotton, manufactured by Gadsden C. S. Oil Co., Gadsden, Ala.	200	1	9	1	1	1	13 80
..	Our Best Fert. Am. D. B. & Potash, manufactured by Tallapoosa Oil Co., Alexander City, Ala.	200	.80	6.50	2.50	.50	2.00	13 24
..	Cotton Queen Guano, manufactured by Tallapoosa Oil Co., Alexander City, Ala.	167	2.06	6.50	2.00	.50	1.00	15 05
..	Cotton Queen Guano, manufactured by Tallapoosa Oil Co., Alexander City, Ala	167	2.00	6.00	1.50	.50	2.00	15 10
..	Waters Special Guano, manufactured by Tallapoosa Oil Co, Alexander City, Ala	200	1.50	7.50	2.30	.50	1.00	15 00

..	Walters Special Dis. Bone and Potash, manufactured by Tallapoosa Oil Co, Alexander City, Ala	200	......	10.00	2.00	1.00	1.00	13 00
..	Coley's & Sandlin's Spe. D. B. and P., manufactured by Tallapoosa Oil Co., Alexander City, Ala.	200	......	10 00	2.00	1.00	1.00	13 00
..	Tallapoosa H. G. Acid, manufactured by Tallapoosa Oil Co., Alexander City, Ala	200	....	11.00	2.50	2.00	....	13 50
..	Tallapoosa Dis. Bone and Potash, manufactured by Tallapoosa Oil Co., Alexander City, Ala	200	....	10.00	2.00	2.00	1.00	13 00
..	Our Best Fertilizer D. B. and P., manufactured by Tallapoosa Oil Co, Alexander City, Ala	200	....	11.00	2.00	1.00	1.00	14 00
..	Standard Guano, manufactured by Tallapoosa Oil Co., Alexander City, Ala	200	1.50	7.50	2.30	.50	1.00	15 00
..	Soluble Guano, manufactured by Tallapoosa Oil Co., Alexander City, Ala	200	2.00	6.50	2.00	.50	1.00	15 10
..	Coley & Sandlin's Special Guano, manufactured by Tallapoosa Oil Co., Alexander City, Ala	200	1.50	7.50	2.30	.50	1.00	15 00
..	Ober's Sol. Am. Sup. Phos. of Lime, manufactured by G. Ober & Sons & Co, Baltimore, Md	200	......	6.50	1.50	2	2	15 04
..	Farmers Standard Am. Phos., manufactured by G. Ober & Sons & Co., Baltimore, Md	200	1.70	6.50	1.50	1.50	2	14 78
..	Ober's Special Am. Dis. Bone, manufactured by G. Ober & Sons & Co., Baltimore, Md	200	1.65	6	3	3	2	15 62
..	Ober's Dis. Bone with Am. and Potash, manufactured by G. Ober & Sons & Co., Baltimore, Md	200	1.00	7	2	1.50	2	13 80
..	Ober's Farmers Mixture, manufactured by G. Ober & Sons Co., Baltimore, Md	200	.75	7	2	1.50	2	13 10
..	Ober's Dis. Bone Phos. and Potash, manufactured by G. Ober & Sons & Co, Baltimore, Md	200	......	8	2	2	2	12 00
..	Ober's Acid Phos. with Potash, manufactured by G. Ober & Sons & Co., Baltimore, Md	200	......	6	2	2	4	12 00
..	Ober's Acid Phos. with Potash, manufactured by G. Ober & Sons & Co., Baltimore, Md	200	....	8	2	2	4	14 00
..	Ober's Standard Am. Dis. Bone, manufactured by G. Ober & Sons & Co., Baltimore, Md	200	1.80	6	2	2	2	15 04

Guaranteed Analyses of Commercial Fertilizers, Filed in the Office of the Commissioner of Agriculture by Dealers and Manufacturers.

When Received.	Name of Fertilizer or Chemical, by Whom Manufactured, and Where Manufactured.	Weight of Package.	Guaranteed Analysis.					Relative Commercial Value.
				Phosphoric Acid.				
			Nitrogen.	Water Soluble.	Citrate Soluble.	Acid Soluble	Potash.	
1900 Oct. 1	Ober's Dis. Bone Phosphate, manufactured by G. Ober & Sons & Co., Baltimore, Md	200	......	11	3	2	......	$14 00
..	Randolph Fertilizer, manufactured by Campbell & Wright, Jr., Roanoke, Ala	200	2 00	6 75	1.25	1.25	1.50	15 00
..	Roanoke Guano, manufactured by Campbell & Wright, Jr., Roanoke, Ala	200	1.75	6 75	1.25	1.25	1.00	13 90
..	Pride of Alabama, manufactured by Campbell & Wright, Jr., Roanoke, Ala	200	1 65	6.75	1.25	1.25	2.00	14 62
..	Jones' Best, manufactured by Campbell & Wright, Jr., Roanoke, Ala.	200	1.65	6.75	1.25	1.25	1.00	13 62
..	H. G. Cotton Grower, manufactured by Campbell & Wright, Jr., Roanoke, Ala	200	.82	8.50	1.50	1.50	1 00	13 30
..	H. G. English Acid Phos., manufactured by Campbell & Wright, Jr., Roanoke, Ala	200	......	10	2 00	2.00	....	12 00
..	Potash Acid Phos., manufactured by Campbell & Wright, Jr., Roanoke, Ala	200	......	8.50	1.50	1.50	2.00	12 00
..	Ashcraft's Formula, manufactured by Tennessee Valley Fert. Co., Florence, Ala	200	....	8.75	1.25	2.76	.....	12 00
..	King Cotton Grower, manufactured by Tennessee Valley Fert. Co., Florence, Ala	200	.82	10.00	.....	2.15	1.00	13 35

Oct. 1	Florence Acid, manufactured by Tennessee Valley Fert. Co., Florence, Ala	200		9.67	3.33	1.98		13.00
..	Tiger Guano, manufactured by Tennessee Valley Fert. Co., Florence, Ala	200		8.75	1.25	2.76	2.00	12 00
..	Corn and Cotton, manufactured by Tennessee Valley Fert Co. Florence, Ala	200	1.65	10.00			1.00	15.62
..	Tiger Acid, manufactured by Tennessee Valley Fert. Co., Florence, Ala	200		11.38	1.62	2.27		13 00
..	Tiger Cotton Grower, manufactured by Tennessee Valley Fert. Co., Florence, Ala	200	.82	10.00			1 00	13 30
..	C. S. Meal and Bone, manufactured by Tennessee Valley Fert. Co., Florence, Ala	200	1.65	10.00			2.00	14 62
..	Blood and Bone, manufactured by Tennessee Valley Fert. Co., Florence, Ala	200	.82	10.00			1.00	13 30
..	H. G. Dis. Bone, manufactured by Tennessee Valley Fert. Co., Florence, Ala	200		12.00				12 00
..	S. and K. Am Diss. Bone, manufactured by Montgomery Fertz Co., Montgomery, Ala	200	.83	8	2	1	1	13 32
..	Kainit, manufactured by Montgomery Fert. Co., Montgomery, Ala	200					12	12 00
..	Montgomery Acid Phos. with Potash, manufactured by Montgomery Fert. Co., Montgomery, Ala	200		8	2	1	2	12 00
..	Meal and Phos. Compound, manufactured by Montgomery Fert. Co., Montgomery, Ala	200	1.65	7	2	1		13 62
..	High Grade Acid Phos., manufactured by Montgomery Fert. Co., Montgomery, Ala	200		11.	2	1		13 00
..	H. G. English Acid Phos., manufrctured by Montgomery Fert. Co., Montgomery, Ala	200		12.	2	1		14 00
..	Star Brand Acid Phos., manufactured by Montgomery Fert. Co., Montgomery, Ala	200		11.	2	1		13 00
..	Early Bird H. G. Acid Phos , manufactured by Montgomery Fert. Co., Montgomery, Ala	200		11.	2	1		13 00
..	S. and K. English Acid Phos., manufactured by Montgomery Fert. Co., Montgomery, Ala	200		11.	2	1		13 00

Guaranteed Analyses of Commercial Fertilizers, Filed in the Office of the Commissioner of Agriculture by Dealers and Manufacturers—Continued.

When Received.	Name of Fertilizer or Chemical, by Whom Manufactured, and Where Manufactured.	Weight of Package.	Guaranteed Analysis. Nitrogen.	Phosphoric Acid. Water Soluble.	Citrate Soluble.	Acid Soluble.	Potash.	Relative Commercial Value.
1900 Oct. 1	S. & O. H. G. Acid Phosphate, manufactured by Montgomery Fertilizer Co., Montgomery, Ala.	200	....	11	2	1	..	13.00
..	Vandiver's XX Acid Phosphate, manufactured by Montgomery Fertilizer Co., Montgomery, Ala.	200	....	11	2	1	..	13 00
..	Griel's English Acid Phosphate, manufactured by Montgomery Fertilizer Co., Montgomery, Ala	200	....	11	2	1	..	13.00
..	Thompson's English Acid Phosphate, manufactured by Montgomery Fertilizer Co., Montgomery, Ala.	200	....	11	2	1	..	13.00
..	Pinckard's Home Mixture, manufactured by Montgomery Fertilizer Co., Montgomery, Ala	200	1.65	7	2	1	2	15.62
..	Alliance Soluble Guano, manufactured by Montgomery Fertilizer Co., Montgomery, Ala	200	1.65	6	2	1	2	14.62
..	Crescent Guano, manufactured by Montgomery Fertilizer Co., Montgomery, Ala	200	1.65	7	2	1	1	14.62
..	Star Brand Guano, manufactured by Montgomery Fertilizer Co., Montgomery, Ala	200	1.65	7	2	1	1	14.62
..	Plow Brand Soluble Guano, manufactured by Montgomery Fertilizer Co., Montgomery, Ala	200	.83	8	2	1	1	13.32
..	H. & F. H. G. Acid Phosphate, manufactured by Montgomery Fertilizer Co., Montgomery, Ala.	200	....	11	2	1	..	13 00

..	W. L. & Co's H. G. Acid Phosphate, manufactured by Montgomery Fertilizer Co., Montgomery, Ala.	200	....	11	2	1	..	13.00
..	Dissolved Bone and Potash, manufactured by Montgomery Fertilizer Co., Montgomery, Ala.	200	....	9	2	1	1	12.00
..	Alkaline Acid Phosphate 4% Potash, manufactured by Montgomery Fe tilizer Co, Montgomery, Ala	200	....	6	2	1	4	12.00
..	English Acid Phosphate with 2% Potash, manufactured by Montgomery Fertilizer Co., Montgomery, Ala.	200	....	10	2	1	2	14.00
..	S a Gull Soluble Guano, manufactured by Montgomery Fertilizer Co., Montgomery, Ala..	200	1.65	7	2	1	2	15.62
..	Capital City Standard Fertilizer, manufactured by Montgomery Fertilizer Co, Montgomery, Ala....	200	1.65	7	2	1	2	15.62
..	Montgomery Blood and Bone Fertilizer, manufactured by Montgomery Fertilizer Co., Montgomery, Ala..	200	1.65	7	2	1	2	15 62
..	Tariff Reform Soluble Guano, manufactured by Montgomery Fertilizer Co., Montgomery, Ala.	200	1.65	7	2	1	2	15.62
..	Clayton Fertilizer, manufactured by Montgomery Fertilizer Co., Montgomery, Ala	200	1.65	7	2	1	2	15.62
..	Southern Pacific Guano, manufactured by Montgomery Fertilizer Co., Montgomery, Ala.	200	.83	8	2	1	1	13.32
..	Our Cotton Queen Guano, manufactured by Montgomery Fertilizer Co., Montgomery, Ala	200	.83	8	2	1	1	13.32
..	Early Bird Soluble Guano, manufactured by Montgomery Fertilizer Co., Montgomery, Ala.	200	.83	8	2	1	1	13.32
..	Vandiver's Ammoniated Dissolved Bones, manufactured by Montgomery Fertilizer Co., Montgomery, Ala	200	.83	8	2	1	1	13.32
..	Ammoniated Dissolved Bones, manufactured by Montgomery Fertilizer Co., Montgomery, Ala.	200	.83	8	2	1	1	13.32
..	Wilson's Special Compound, manufactured by Montgomery Fertilizer Co., Montgomery, Ala.	200	.83	8	2	1	1	13.32
..	Schuessler & Co., manufactured by Opelika Chemical Co., Opelika, Ala.	200	....	..	..	..	..	.....
..	Schuessler H. G. Fertilizer, manufactured by Opelika Chemical Co., Opelika, Ala.	200	1.65	6	2	1	2	14.62

Guaranteed Analyses of Commercial Fertilizers, Filed in the office of the Commissioner of Agriculture by Dealers and Manufacturers.

When Received.	Name of Fertilizer or Chemical, by Whom Manufactured, and Where Manufactured.	Weight of Package	Guaranteed Analyses: Nitrogen.	Phosphoric Acid: Water Soluble.	Phosphoric Acid: Citrate Soluble.	Phosphoric Acid: Acid Soluble.	Potash.	Relative Commercial Value.
1900 Oct. 1	Schuessler & Co. Special Formula, manufactured by Opelika Chemical Co., Opelika, Ala.	200	.83	8	2	1	3	$ 15 32
..	Schuessler & Co. Beef Blood and Bone, manufactured by Opelika Chemical Co., Opelika, Ala.	200	.83	8	2	1	1	13 32
..	Schuessler & Co H. G. Bone and Potash, manufactured by Opelika Chemical Co., Opelika, Ala	200	......	8	2	1	2	12 00
..	Schuessler & Co. H. G. English Acid Phos., manufactured by Opelika Chemical Co., Opelika, Ala.	200	......	10	2	1	....	12 00
..	Schuessler Bros. H. G. Guano, manufactured by Opelika Chemical Co., Opelika, Ala.	200	1.65	7	2	1	1	14 62
..	Schuessler Bros. H. G. Bone and Potash, manufactured by Opelika Chemical Co., Opelika, Ala.	200	......	8	2	1	2	12 00
..	Schuessler Bros. XXX Bone and Potash, manufactured by Opelika Chemical Co., Opelika, Ala.	200	......	9	2	1	1	12 00
..	Kainit, manufactured by Opelika Chemical Company, Opelika. Ala	200	......	....	......	.....	12	12 00
..	C. C C. Standard Fertilizer, manufactured by Opelika Chemical Co., Opelika, Ala	200	1.65	6	2	1	2	14 62
..	Diamond Soluble Guano, manufactured by Opelika Chemical Co., Opelika, Ala.	200	1.65	7	2	1	1	14 62

..	Good Luck Soluble Guano, manufactured by Opelika Chemical Co., Opelika, Ala.	200	.83	8	2	1	1	13 32
..	Standard Acid Phosphate, manufactured by Opelika Chemical Co., Opelika, Ala.	200	....	11	2	1	......	13 00
..	Opelika Acid Phos. with 2% Potash, manufactured by Opelika Chemical Co., Opelika, Ala.	200	....	8	2	1	2	12 00
..	Blood and Bone Guano, manufactured by Opelika Chemical Co., Opelika, Ala.	200	1.65	7	2	1	1	14 62
..	J. C. Adkin & Son, No. 1 Acid Phos., manufactured by Opelika Chemical Co., Opelika, Ala.	200	....	11	2	1	.....	13 00
..	H. G. English Acid Phosphate, manufactured by Opelika Chemical Co., Opelika, Ala.	200	....	10	2	1	....	12 00
..	Potash Acid Phosphate, manufactured by Opelika Chemical Co., Opelika, Ala.	200	....	8	2	1	2	12 00
..	W. C. Bradley & Co's. Standard Guano, manufactured by Virginia-Carolina Chemical Co., Charleston, S. C.	200	1.65	6	2	2	2	14 62
..	W. C. Bradley & Co's. Soluble Guano, manufactured by Virg'a-Car. Chemical Co., Richmond, Va.	200	1.65	7	3	2	2	14 62
..	W. C. Bradley & Co's H. G. Potash Acid, manufactured by Virginia-Carolina Chemical Co., Richmond, Va.	200	....	9	3	2	2	14 00
..	W. C. Bradley & Co's. H. G. Acid Phosphate, manufactured by Virginia-Carolina Chemical Co., Richmond, Va	200	....	10	4	2	.....	14 00
..	W. C. Bradley & Co's. Standard Pot Acid, manufactured by Virginia-Carolina Chemical Co., Richmond, Va.	200	....	7	3	2	2	12 00
..	T. W. & Co's Eng. H. G. Acid with Mur. Potash, manufactured by Virginia-Carolina Chemical Co., Richmond, Va.	200	.....	9	3	1	1	13 00
..	T. W. & Co's. Bone and Muriate of Potash, manufactured by Virginia-Carolina Chemical Co., Richmond, Va	200	....	7	3	2	2	12 00
..	T. W. & Co's. Special H. G. Potash Guano, manufactured by Virginia-Carolina Chemical Co., Richmond, Va.	200	.82	7	3	2	3	15 30
..	T. W. & Co's Muriate of Potash Mixture, manufactured by Virginia-Carolina Chemical Co., Richmond, Va	200	....	9	3	1	2	14 00

Guaranteed Analyses of Commercial Fertilizers, Filed in the Office of the Commissioner of Agriculture by Dealers and Manufacturers--Continued.

When Received.	Name of Fertilizer or Chemical, by Whom Manufactured, and Where Manufactured	Weight of Package.	Guaranteed Analysis.					Relative Commercial Value.
			Nitrogen.	Phosphoric Acid.			Potash.	
				Water Soluble.	Citrate Soluble.	Acid Soluble.		
1900 Oct. 1	Blanchard H. G. Acid Phos., manufactured by Virginia-Carolina Chemical Co., Atlanta, Ga.	200	......	10	4	2	....	$14 00
..	Rome Soluble Guano, manufactured by Rome Guano Co, Rome, Ga.	200	1.65	6	2	1	2	14 62
..	Blood and Bone with Potash, manufactured by Rome Guano Co, Rome, Ga	200	.85	8	2	1	1	13.38
..	Royal Guano, manufactured by Rome Guano Co., Rome, Ga.	200	1.65	8	2	1	......	14 62
..	High Bone and Potash, manufactured by Rome Guano Co., Rome, Go.	200	......	8	2	1	2	12 00
..	Standard Acid Phos., manufactured by Rome Guano Co. Rome, Ga.	200	......	10	2	1	....	12 00
..	National Diss. Bone, manufactured by National Fertz Co., Nashville, Tenn.	200	.82	6	4	.....	2	13 29
..	Blood and Bone Guano, manufactured by National Fertz. Co., Nashville, Tenn.	200	.82	6	4	....	2	13 29
..	Rock City Guano, manufactured by National Fertz. Co., Nashville, Tenn.	200	1.64	5	3	.....	2	14 59
..	Tennessee Guano, manufactured by National Fertz. Co., Nashville, Tenn.	200	1.64	5	3	......	3	14 59

Oct. 1	Acid Phosphate, manufactured by National Fertz. Co., Nashville, Tenn	200	....	8	4	....	......	12 00
..	Acid Phosphate, manufactured by National Fertz. Co., Nashville, Tenn	200	....	10	3	.....	....	13 00
..	Acid Phosphate, manufactured by National Fertz. Co., Nashville, Tenn	200	....	10	4	.....	......	14 00
..	Tennessee H. G. Diss. Bone, manufactured by National Fertz. Co., Nashville, Tenn	200	....	10	4	......	....	14 00
..	Acid Phosphate, manufactured by National Fertz. Co., Nashville, Tenn	300	....	11	4	......	.....	15 00
..	Tennessee H. G. Diss. Bone, manufactured by National Fertz. Co., Nashville, Tenn	200	....	10	4	.....	.....	14 00
..	Tennessee H. G. Diss. Bone, manufactured by National Fertz. Co., Nashville, Tenn	200	....	11	4	......	......	15 00
..	Tennessee H. G. Diss. Bone, manufactured by National Fertz. Co, Nashville, Tenn	200	....	12	4	.....	.....	16 00
..	Tennessee H. G. Dis. Bone, with Potash, manufactured by National Fertz. Co., Nashville, Tenn	200	....	6	4	......	1	11 00
..	Tennessee H. G. Dis. Bone, with Potash, manufactured by National Fertz. Co., Nashville, Tenn	200	......	8	4	......	2	14 00
..	Sadler's Formula, manufactured by National Fertz. Co., Nashville, Tenn	200	....	8	4	......	2	14 00
..	Tennessee H. G. Diss. Bone, manufactured by National Fertz. Co., Nashville, Tenn	200	....	8	4	......	......	12 00
..	Tennessee H. G Diss. Bone and Potash, manufactured by National Fertz. Co	200	....	6	4	......	2	12 00
..	Acid Phos. with Potash, manufactured by National Fertz. Co., Nashville, Tenn	200	....	6	4	....	1	11 00
..	Acid Phos. with Potash, manufactured by National Fertz. Co., Nashville, Tenn	200	....	8	4	......	2	14 00
..	Tennessee Century Guano, manufactured by National Fertz. Co., Nashville, Tenn	200	....	8	4	......	4	16 00
..	Tennessee H. G. Acid Phos., manufactured by National Fertz. Co., Nashville, Tenn	200	....	11	4	.....	......	15 00

Guaranteed Analyses of Commercial Fertilizers, Filed in the Office of the Commissioner of Agriculture by Dealers and Manufacturers—Concluded.

When Received.	Name of Fertilizer or Chemical, by Whom Manufactured, and Where Manufactured.	Weight of Package.	Guaranteed Analysis.					Relative Commercial Valve.
				Phosphoric Acid.				
			Nitrogen.	Water Soluble.	Citrate Soluble.	Acid Soluble.	Potash.	
1909 Oct. 1	Old Hickory Guano, manufactured by National Fertz. Co., Nashville, Tenn	200	1.64	5	3	.....	2	$14 59
..	Old Hickory Guano, manufactured by National Fertz Co., Nashville, Tenn.	200	1.64	6	4	.....	3	16 59
..	Ammoniated Diss. Bone, manufactured by Nalional Fertz. Co., Nashville, Tenn	200	.82	6	4	.....	1	13 29
..	Alabama Fertilizer, manufactured by Alabama Fertz Co., Montgomery, Ala	200	1.80	7	1.50	.....	1.50	15 04
..	Acid Phosphate, manufactured by Alabama Fertz. Co., Montgomery, Ala	200	....	11	2	.....	.....	13 00
..	Kainit, manufactured by Alabama Fertz. Co., Montgomery, Ala	200	....	.....	....	.....	12.	12 00
..	Muriate of Potash, manufactured by Alabama Fertz. Co., Montgomery, Ala.	200	....	....	....	.....	52.	52 00
..	Concentrated Tankage, manufactured by Hiller, Hirsh & Co., New York	200	13.	.....	.....	.....	.....	36 40
..	Ground Blood, manufactured by Swift & Co., Chicago	200	14.	.....	.....	.....	.....	42 00

LICENSES.

The following is a list of the Licenses issued this season to July 1st, 1901, with the date when issued, number of license, and post office of the local dealers.

Date of Issue.		Name.	P. O. Address.	No. of License.
1900.				
Oct.	3	Adair & McCarty Bros.	Atlanta, Ga	4
..	15	Armour Fertilizer Works	Kansas City, Mo	29
..	50	Alabama Fertilizer Co	Montgomery	37
Nov.	19	Adamson & Edwards	Ophelia	53
Dec.	14	Acree, O. A. C	Newton	68
..	27	Adamson, Edwards & Co.	Ophelia	86
..	29	Allridge & Shelton	Brooksville	87
..	31	Allen, C. B	Ashland	95
1901.				
Jan.	7	Andrews, W. T	Gold Hill	133
..	11	Andrews & Co	Camp Hill	172
..	12	Alston, S. F	Tuscaloosa	174
..	12	Akin, J. C	Notasulga	178
..	15	Alston & Farrow	Wetumpka	184
..	15	Adkinson, D. I B	Florala	189
..	15	Atkins, V. B. & Co	Selma	193
..	15	Akin, J. C	Camp Hill	206
..	15	Agee, R. H. & W. C	Selma	252
..	15	Ashepoo Fertilizer Co	Charlston, S. C	265
..	17	Atkinson & Atkinson	Jemison	319
..	17	Atkin & Allgood	Thornton	341
..	21	Albritton, E. S	Warrior	400
..	21	Ashhurst, J. V	Tallassee	416
..	22	Arnold, W. A	Ozark	424
..	23	Allen & Co., R. W	Lafayette	441
..	23	Atkins, L. C. & Co	Langston	445
..	25	Atkins, Jos. M	Brompton	467
Feb.	1	Adams, J. E	Welden	512
..	4	Arant, J. M. & Sons	Waverly	533
..	5	Abecrombie, A. J	Leeds	545
..	7	Atkins, B. C	Reform	561
..	8	Amos, G. H	Duck Springs	573
..	13	Agee, W. P	Perdue Hill	594
..	19	Allen, L. M. & Co	Phil Campbell	625
..	19	Abecrombie, J. H	Leeds	636
..	19	Anthony, W. L	Hurtsboro	637
..	20	Ash & Crandall	Birmingham	652
..	20	Alderhold, J. L	Piedmont	656
Mch.	16	Appling Mercantile Co	Oakman	750
..	19	Adams, J. G	Anniston	757

LICENSES—Continued.

Date of Issue.		Name.	P. O. Address.	No. of License.
1901				
Mch.	26	Awbry, J. J	Mason, Ga	771
Apl.	4	Atkins & Owens	Heflin	785
"	22	Alford, J. C. & Son	Childersburg	803
1900				
Oot.	3	Bailey, W. E	Aster	11
"	11	Birmingham Fertilizer Co	Birmingham	26
Dec.	10	Brantley, T. K. & Ivie	Troy	58
"	10	Butler, Cole & Co	New Hope	61
"	13	Buford & Co.	Hartford	67
"	22	Bank of Enterprise	Enterprise	81
1901				
Jan.	2	Benson Henderson & Co	Andalusia	101
"	4	Beeland, J. T. & Bro	Greenville	114
"	7	Brice, J. A	Oneonta	130
"	7	Brown. J. A	Kellyton	136
"	8	Bates, J. T	Plevna	138
"	8	Butler, F. T. & J. C	Paint Rock	146
"	14	Brannon & Henderson	Troy	199
"	15	Brown, W. S	Birmingham	234
"	15	Bradley Fertilizer Co	Charleston, S. C	249
"	15	Bean & McMurry	Heflin	254
"	15	Beach, H. M. & Son	Columbia	258
"	16	Brown, J. W	Sylacauga	278
"	16	Brown, W. D	Gravella	292
"	17	Bea e Bros	Luverne	314
"	17	Barnes, Jasper E	Dothan	317
"	17	Beason, J. L. & Co	Whitney	320
"	17	Boon, Alonzo	Camp Hill	334
"	17	Bullard, Bartow	Elba	342
"	17	Barfield Bros	Barfield	343
"	17	Bell, C. W. & Sons	Lineville	344
"	18	Blackburn, J. W. & McConnel	Fayette	349
"	18	Butler, C. H	Childersburg	351
"	18	Bullock, J. A	Shorter	364
"	19	Bellinger, W. C	Gadsden	375
"	19	Bodiford. W. H	Abbeville	380
"	21	Britt & Johnson	Wetumpka	388
"	21	Bryan, T. L. & Co	Ozark	395
"	21	Bains Bros	Cleveland	397
"	21	Burns & Beavers	Lincoln	398
"	21	Brake, J. L	Warrior	399
"	21	Barnett, W. W	Geneva	401
"	23	Beyer, F. & Son	Cullman	444
"	25	Brantzy, T. M	Kennedy	465
"	25	Baird, S. J	Guin	468
"	25	Bynum, W. H	Boaz	469
"	29	Blackwood, D. R	Cleveland	488
"	30	Butler, J. E	New Hope	497
"	30	Brodbeck & Zundel Bros	Point Clear	498
"	31	Boyett Bros & Rodgers	Andalusia	507

LICENSES—Continued.

Date of Issue.		Name.	P. O. Address.	No. of License.
1901.				
Jan.	28	Bear, Lewis & Co	Pensacola, Fla	481
..	28	Brawner & Brawner	Castlebury, Ala	482
..	28	Burt, R. A	Collinsville	483
Feb.	1	Bell J. J	Florala	515
..	2	Banks, T. C	Attalla	522
..	2	Burks & Coston	Brantley	526
..	4	Brundridge Banking Co	Brundridge	529
..	4	Bynum, T. D	Bynums	532
..	7	Bowdon, C. P	Gordon	555
..	7	Boreland, J. B. & Co	Pinckard	564
..	11	Burgess, J. L	Scottsboro	587
..	13	Blansitt Bros	Sulphur Springs	596
..	13	Brown & York	Boaz	606
..	13	Bell, W. R	Goddard	614
.	16	Barton, W. M	Lynn	623
..	16	Baits, G. J. & J. W	Toney	629
..	19	Black, Jas. A	Luverne	647
..	20	Bryant & Williams	Notasulga	653
..	25	Baccus, W. B. & Son	Baccus	670
Mch.	5	Baker, D. W	Goodwater	683
..	5	Boazman, Tom	Marcoot	686
..	7	Byers, Mrs. Ada V	Ashville	697
..	11	Babcock, H. T	Troy	714
..	12	Blackburn, N. W. & Co	Leesburg	733
..	16	Braswell, M. L	Pleasant Gap	740
..	21	Brittain, J. C	Summit	761
.	4	Butler & Collier	Gurley	796
..	26	Banks & Owen	Hurtsboro	806
May	4	Banks, R. D	Jackson's Gap	809
1900.				
Oct.	3	Continental Fertilizer Co	Nashville, Tenn	7
.	31	Campbell & Wright, Jr	Roanoke, Ala	39
Nov.	20	Cowart, J. H. & Co	Goshen	55
Dec.	10	Cameron, Jas. A	Columbiana	63
..	12	Covington, J. I	Bertha	66
..	15	Cassels Bros	Gadsden	70
..	21	Cross, W. S	Pelham	78
..	29	Coley & Sandlin	Alexander City	92
1901.				
Jan.	5	Carlisle, M. W. & Bro	Roanoke	125
..	5	Crew, C. M	Goodwater	126
..	7	Cox, L. O	Boaz	127
..	9	Cullman Cotton Co	Cullman	149
..	11	Clark & Parker Bros	Searight	166
..	12	Crump, J. C. & Son	Sand Mountain	177
..	14	Copeland, J. S	Troy	200
..	15	Crumpton, W. E	Maplesville	216
..	15	Cawthon, W. C. W	Andalusia	224
..	15	Carter Co., The J. H	Cullman	225
..	15	Cleveland, M. L. & Co	Randolph	245
..	15	Cameron Bros	Notasulga	237

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Date of Issue.		Name.	P. O. Address.	No. of License.
1901.				
Jan.	15	Carney, W. M. & Co	Atmore	239
..	15	Cantelou, Lamar & Son	Wetumpka	262
..	16	Cross, Fred	Portersville	271
..	17	Crew, B. F	Goodwater	322
..	17	Carter, Jno. S	Haleyville	333
..	17	Cole, G. P	Loachapoka	339
..	17	Cornelius, H. M	Walnut Grove	347
..	19	Carroll, J. S	Troy	371
..	19	Chapman & Co	Geneva	379
..	21	Crew, J. W	Elamville	389
..	21	Campbell & Wright	Tuskegee	391
..	21	Capps, D. W	Capps	405
..	21	Carroll & Watson	Watford	406
..	23	Cobb, H. C	Millbrook	431
..	23	Columbia Fertilizer Co	Columbia	432
..	23	Colquitt Bros	Luverne	434
..	23	Chadwick & Brice	Snead	435
..	23	Curry, W. W	Albertville	438
..	23	Carr, J. A	Carrville	446
..	28	Collins, N. S	Collinsville	476
..	28	Collins, J. R	Bankston	480
Feb.	1	Chapman & Warren	Georgiana	509
..	1	Cosper, R. E	Sterrett	517
..	4	Collins, H. D	Fayette	541
..	8	Coxwell, Jno. M	Perdue Hill	571
..	9	Carleton & Co	Dudleysville	582
..	13	Clarke & Harwell	LaGrange, Ga	589
..	16	Cope, A. M	Union Springs, Ala	627
..	20	Crutchen & Ward	Cuba	654
..	23	Cox, W. H	Springville	667
Mch.	5	Collins, The Co	Warrior	677
..	5	Costin, J. W. & Co	Luverne	692
..	9	Cartwright, R. N	Cartwright	704
..	11	Crew, R. A. & Son	Goodwater	717
..	12	Cooper, J. F	Fax	729
..	16	Clem, R. M	Fairmount	738
..	16	Coleman & McAlpin	York	744
..	16	Clements, N. B	Oregonia	747
..	30	Crump, H. C	Sedden	779
April	6	Cothran, T. E	Alexis	791
..	22	Crow Bros	Jacksonville	804
1900.				
Oct.	22	Davenport, N. S	Valley Head	32
Nov.	12	Dothan Guano Co	Dothan	48
1901.				
Jan.	4	Dawkins, W. T	Abbeville	109
..	8	Dean, J. J	Charlton	140
..	10	Davis, B	Clayton	161
..	10	Donaldson & Shaw	Haleyville	163

LICENSES—Continued.

Date of Issue.		Name.	P. O. Address.	No. of License.
1901				
Jan.	14	Dyer, W. C	Stanton	197
"	15	Dennis, J. A. & Co	Ansley	209
"	15	Dent, Geo. H	Eufaula	243
"	15	Dan, J. P	Milport	246
"	16	Dumas, O. & C. P	Arlington	294
"	16	Davis, W. C. & Co	Sand Mountain	298
"	16	Draper & Co	Oxford	303
"	17	Dailey, M. W	Avoca	338
"	18	Dorman, Jas. F	Carrville	350
Nov.	21	Davis, E. R	Rock Run Station	402
"	21	Darrow, E. J	Coats Bend	404
"	23	Duncan, E. P	Alexander City	440
"	24	Downey, J. W. & T. B. Chattin	Section	450
Feb.	4	Dyar, C. M. & L F	Reedbrake	536
"	5	Deramus, D. I	Verbena	546
"	6	Downs, J. B	Clanton	551
"	11	Dunn, A. M	Elamville	588
"	13	Doughty, J	Fayette	610
"	19	Decatur Warehouse & Milling Co	Decatur	643
"	25	Davenport, E. T. & Co	Valley Head	671
Mch.	5	Dunlap, W. R	Wolf Creek	678
"	5	Davis, Marshall & Co	Mobile	695
"	12	Duncan, R. A	Dickson	727
"	16	Davis, Chas. S	Hurtsboro	743
Apl.	9	Dean, J. I	Red Level	789
1900				
Oct.	12	Elrod & Gibson	Collinsville	28
Dec.	28	Earle, Terrell & Co	Birmingham	88
1901				
Jan.	15	Emmett, L. S., Son & Co	Albertville	253
"	16	Edmonson, R. Q. & Bro	Eufaula	281
"	18	Espy, Jno. R	Gordon	355
"	22	Ellis, J. M. & Son	Union Springs	430
"	26	Evens Bro's	Heflin	473
Feb.	1	Echols & Hargrove	Hartselle	519
"	5	Ellison, W L	Walnut Grove	543
"	7	Edwards, J. B	Talladega	554
"	19	Eubanks & Cheney	Piedmont	642
"	20	Edwards, R. D	Sylacauga	650
Mch.	16	Elliott, J. A & Son	Moundville	746
"	16	Evens, D. H	Hillion's Store	749
May	17	Elington, S. M	Munford	815
1900				
Oct.	3	Furman Farm Improvement Co	Atlanta &E't Pt.,Ga	5
Nov.	15	Farmers & Merchants Bank	Troy	50
Dec.	14	Foy, Cliff & Bro's	Abbeville	69
"	20	First Bank of Elba	Elba	76
1901				
Jan.	4	Folmar, W. B	Troy	111
"	4	Frazen & Olson	Thorsby	112

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Date of Issue.		Name.	P. O. Address.	No. of License.
1901				
Jan.	4	Flynt, H. L	Guntersville	117
"	5	Folmer, Walden & Byrd	Enterprise	121
"	10	Farley, Jno. C	Opelika	162
"	14	Farmers Alliance Co-operative Co	Opelika	191
"	14	Farrow, T. L	Guntersville	203
"	15	Fuller, Foshee Mercantile Co	Brewton	222
"	15	Fuller, J. H. & Sons	Alexander City	255
"	19	Farnham, J. H	Evergreen	369
"	22	Fleming, W. L. & Son	Brundidge	425
"	23	Forrester, R. B	Cowarts	439
"	30	Fountain, H. B	Albertsville	502
Feb.	4	French, J. E.	Brundidge	528
"	19	Flippo & Phillips	Bear Creek	646
"	23	Farrell, J. D	China Grove	669
Mch.	5	Fort Gaines Oil and Guano Co	Fort Gaines, Ga	675
"	12	Foust, V	Rosa	726
"	13	Feagin, T. K	Feagin.	734
"	16	Fruitdale Lumber Co	Fruitdale	748
"	19	Frames, J. H	Slate	756
"	26	Farrin, A. J	Ohatchee	754
"	28	Fielder, J. B	Loachapoka	772
"	28	Fields, A. S	Fern Bank	774
1900				
Oct.	3	Goulding Fertilizer Co	Pensacola, Fla	8
"	6	Georgia Chemical Works	Augusta, Ga	22
"	8	Grisham, J. M	Whitehead.	24
Dec.	10	Gadsden Installment House	Gadsden	59
"	19	Gadsden Cotton Seed Oil Co	Gadsden	74
1901				
Jan.	3	Gulledge, F. A	Verbena	104
"	3	Goldthwaite, Robt	Montgomery	108
"	14	Guthrie Bros	Sulligent	179
"	15	Gary, Kennedy & Co	Selma	228
"	15	Griel Bro's & Co.	Montgomery	241
"	15	Guin Bro's	Kennedy	245
"	16	Gilbert, R. F	Portersville	278
"	16	Grady, J. W	Stroud	282
"	16	Guntersville Dry Goods Co., The	Guntersville	304
"	16	Grant Bro's	Louisville	307
"	17	Gilliland, C. H. & Sons	Goodwater	325
"	17	Gray, J. B. & W. W. Gulledge	Ohatchie	336
"	19	Gunter, G. W	Brockton	382
"	21	Gunter & Ealum	Gantt	409
"	24	Green, Jas. F	Arthur	451
"	28	Green, Alex	Thomasville	486
"	39	Green & Mullins	Active	496
Feb.	2	Gallant, J. A	Gallant	525
"	4	Glenn Bro's	Branchville	534
"	7	Golden, B. F	Thaddeus	558
"	13	Graham, J. R	Boliver	590

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1901.				
Feb.	13	Gage, W. A. & Co	Town Creek	592
..	13	Graves & Burdine	Deposit	598
..	13	Grace, J. W	Elkmont	611
..	14	Gilbert, J. J. & Sons	Gold Mine	615
..	16	Gilbert, John R	Pinckneyville	630
..	22	Gilliland, M. E	Hill	659
..	22	Griffith, Asa	Hanceville	660
Mch.	5	Griffis & Son	Sedden	676
..	5	Gray, Wm	Dadeville	685
..	9	Griffith, G. F	Hokes Bluff	705
..	12	Guin, P. C	Covin	731
..	12	Gable & Clapp	Gum Springs	732
..	19	Gilbert, P. N	Coalville	758
..	30	Gammill, J. W	Camp Hill	775
Apl.	23	Gooday Bros	Daphne	799
May	4	Goldson Harper & Son	Brocton	808
..	4	Gray, W. C. & Co	Oxford	811
1900.				
Oct.	3	Home Mixture Guano Co	Columbus, Ga	9
..	11	Helm Bone Fertilizer Co	Birmingham	25
..	33	Howe & Co	Stevenson	34
..	31	Holman, H. C	Ozark	40
Nov.	15	Henderson, Fox	Troy	51
Dec.	10	Ham, P J. & Sons	Elba	60
..	19	Henderson, Rainer & Hill	Brantley	75
..	21	Howell, J. R. G	Dothan	77
..	22	Henderson, Holloway & Co	Enterprise	82
	31	Hester, R. B. & Son	Roanoke	93
..	31	Holly & Lindsay	Abbeville	94
1901.				
Jan.	1	Henderson, J. D. & Co	Searight	99
..	2	Hill, Jones & Co	Roanoke	102
..	3	Hill & Shaffey	Dadeville	106
..	4	Hilton, Bentley & Cosby	Brantley	113
..	4	Hatton, D. J. & Son	Wait	115
..	4	Howard, J. M	Albertville	168
..	4	Howle, T. A. & Co	Oxford	173
..	14	Herring, T. J	Midland City	194
..	16	Hilliard, W. L	Troy	198
..	14	Henderson, J. Robt	Fullerton	205
..	15	Henderson & Waters Bros	Brundridge	218
..	15	Howle Bros	Wetumpka	230
..	15	Hertzler & Anderson	Madison	231
..	15	Howison, Allen P	Randolph	286
..	16	Henderson, Chas	Troy	269
	16	Henry, S. W	Springville	272
..	16	Harrison, W. D. & Co	Ashford	295
..	16	Henderson, J. H	Cross Keys	300
..	16	Hartsell, J. C, & Son	Hartselle	310
..	17	Hooper, C. W. & Co	Selma	323

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1901				
Jan.	17	Hughes & Bros	Flolala	329
"	18	Harwell, W. O	Opelika	354
"	19	Hixon, S D. & D. A	Perote	387
"	21	Head, T. L	China Grove	403
"	21	Hughes, D. D	Labanon	414
"	21	Hooper, A. B	Alexander City	415
"	22	Haralson, J. B	Langston	416
"	22	Haynes, D. P. & Bro	Oxford	428
"	23	Hartsell, J. P	Hartselle	442
"	23	Hoffman & Graves	Waverly	443
"	23	Hixon Bros	Hixon	447
"	24	Haynes, Parker & Co	Lineville	448
"	24	Haight, J. H. & Son	Fruitdale	453
"	24	Hicks, W. W. & Co	Dadeville	455
"	25	Harrell, W. F	Bangor	460
"	29	Hodo, J. B	Millport	489
"	30	Hammond, M. W	Marl	493
"	30	Hood, J. M. & Son	Albertsville	501
"	31	Heard & Lee	Camp Hill	506
Feb.	1	Hamilton, M. D. & Co	Guin	514
"	1	Herrin & Oliver	Dadeville	531
"	4	Head & Warren	Gum Springs	547
"	6	Hicks & Heard	Camp Hill	548
"	6	Hedges, J. A	Ashville	570
"	6	Hightower, C. B	York Station	578
"	6	Haley Bros	Hayleyville	579
"	6	Hamilton, N. O	Ragland	581
"	6	Hood, Yielding & Co	Birmingham	584
"	6	Hood, Robt	Kymulga	602
"	6	Henderson & Black	Troy	604
"	6	Henderson, Alex. & Co	Troy	605
"	6	Hamilton, R. F	Coal City	617
"	6	Herston & Barnes	Garland	673
"	6	Hitchcock, J. G. & Son	James	690
"	6	Hearn & Wood	York	700
Mch.	8	Harris & Sherrod	Courtland	703
"	8	Harkins, Max & Clyde	Fayette	718
"	11	Hudson, F. N	Blountsville	741
"	16	Hargrove, J. H	Hartselle	760
"	21	Hendrix, S. T	Peterman	762
"	30	Hodges Mercantile Co	Ashville	780
Apl.	5	Hollinsworth & Co	Millin	787
"	10	Haynie, A. C	Hurtsboro	792
"	22	Hines & Son	Standing Rock	800
"	25	Hall, J. A	Pea Ridge	805
Dec	6	Ingram & Co	Anniston	64
Jan.	15	Ivey, J. W	Rutledge	211
Feb.	4	Ingram & Trawick	Opelika	537
"	19	Ivey, Chas	Evergreen	638

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Date of Issue.	Name.	P. O. Address.	No. of License.
1900			
Oct. 23	Jones, J. B	Fayette	35
Dec. 29	Johnston, Geo. A	Clayton	91
1901			
Jan. 15	Jones, V. D	Troy	238
.. 15	Johnson, W. A	Rutledge	256
.. 18	Johnston, Thos. L. & Co	Gadsden	359
.. 21	Jennings, B	Tuskegee	390
.. 21	Jordan, H R. & Son	Collinsville	392
.. 22	Jackson, Jess H	Grand Bay	420
Feb. 1	Jemison, S. E	Sunny Side	511
.. 2	Johnson, L. M	Alexander City	523
.. 8	Johnson, J. J	Geneva	577
.. 13	Jackson, Geo. W	Mount Hope	591
Mch. 5	Johnson, J. E	Chattanooga, Tenn	694
Apl. 5	Jones, A. F	Talladega	786
1900			
Oct. 18	Killian, H. H	Branden	30
1901			
Jan. 11	King, H. S	Searight	167
.. 11	Kelly & Segrist	Midland City	169
.. 16	Kyser, Geo. W	Ripton	277
.. 16	Kroell, Geo	Montevallo	279
.. 16	King, F R. & Co	Leighton	312
.. 19	King, Claude	Leighton	386
.. 21	Klaus, J & Co	Huntsville	413
.. 22	Kitchens, J. W. & Bro	Heflin	421
.. 24	Kelly, D. E. & J. O	Jeff	457
.. 28	Kelly, Walter	Normal	497
.. 28	Killen Dry Goods Co., The	Fort Payne	484
Feb. 6	Kennedy, J. A	Loop	552
Mch. 9	Kinney, P. H. & Co	Navvoo	705
Apl. 5	Keener, D. P	Keener	784
1900			
Oct. 3	Louisville Fertilizer Co	Louisville, Ky	14
Dec. 11	Long Bro's	Jasper	65
.. 21	Long-Richardson Mercantile Co	Jasper	80
1901			
Jan. 2	Law, Edmons & Byrd	Enterprise	97
.. 5	Lester & Co	Columbiana	123
.. 7	Leach, R. R	Liberty	135
.. 8	Land, J. G	Cullman	145
.. 9	Loeb, J. & Bro	Montgomery	147
.. 12	Lauderdale, A. R	Goodwater	175
.. 14	Lull & Lacy	Wetumpka	202
.. 15	Lazinby, Reynolds & Co	Forest Home	212
.. 15	Langston, J. N	Jemison	217
.. 15	Little, Chas. E	Auburn	247
.. 15	Law & Davis	Lincoln	261
.. 16	Lidden, F. B. & Co	Gordon	284
.. 16	Lane Bro's	Sylacauga	291

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1901				
Jan.	18	Leath, Scott	Cullman	357
..	18	Leeman, E. D	Athens	365
..	19	Landers Bro's	Heflin	383
..	23	Long, T	Greenville	433
..	28	Latham, S. A. & Co	Montevallo	478
..	29	Livingston, Y. C	Notasulga	487
..	30	Long, C. W	Granger	495
Feb.	7	Lowery, W. W. & Co	Atmore	563
..	7	Long, W R	Lynn	565
..	13	Legg, Joel W	Elkmont	595
..	13	Lagney, H. W	Eden	607
..	13	Linn, W. W	Falkville	612
..	13	Logan, W. J. P	Benson	613
..	16	Laxon & McCord	New Market	621
..	19	Landham, J. R. & Co	Anniston	632
..	22	Lewis & Estes	Athens	661
Mch.	9	Lile, J. L	Trinity	707
..	18	Lumpkins, J. B. H	Jacksonville	755
..	30	Lowe, A. S	Hazel Green	781
Apl.	10	Lyon, R. L	Riley	794
..	10	Lee, W. A	Glen Allen	795
..	26	Lefils, W. F. & Son	Easonville	807
May	28	Lloyd, Ellison & Co	Creek Stand	812
1900				
Oct.	3	Marietta Guano Co	Atlanta, Ga	2
..	3	Mobile Phosphate Co	Mobile	10
..	3	Meridian Fertilizer Factory	Meridian	13
..	3	Montgomery Fertilizer Co	Montgomery	19
..	30	Marks & Gayle	Montgomery	36
Nov.	12	Malone & Sons	Dothan	47
Dec.	19	Meadows, Smith T. & Co	Opelika	73
..	31	Mullins, W. I	Clanton	96
1901				
Jan.	3	Manley, Hornsbey & Handley	Roanoke	107
..	7	Mills, J. B.	Abbeville	129
..	7	Milner, Henry	Columbiana	131
..	8	Moon & Harris	Lineville	139
..	14	Macon, W. H	Wetumpka	183
..	14	Masterson, T. C	Arcola	204
..	15	Moody, J. W. & Son	Brompton	233
..	15	Middlebrook, J. Z	Elamville	250
..	16	Maxwell, C. R	Northport	287
..	16	Metcalf, P. M	Hartford	286
..	16	Miller, Lovelace & Co	Dadeville	306
..	17	Mizell & Bro	Ozark	316
..	17	Mayo, A. B.	Talladega	329
..	17	Milligan, W. G	Heflin	345
..	17	Mahan, W. H. & Son	Randolph	348
..	19	Murphree, Joel D	Troy	370
..	19	Murphree, J. D Jr., Cashier	Troy	379

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1901			
Jan. 21	Myers, H. J	Langston	396
" 30	Moog & Weil	Battles	500
Feb'y. 4	Murdock, E. H. & A. S	Coffee Springs	542
" 7	Moore, Chancey & Pepper	Phil Campbell	559
" 16	Mays & Winter	Waverly	625
" 23	Merritt & Adams	Geneva	666
Mch. 5	Melton & Co	Pine Apple	682
" 5	Mills, W. R & Sons	Pine Apple	688
" 7	Maroney, C. L. & Co	Montevallo	696
" 9	Miller & Sons	Oxford	708
" 11	Mathews, J. E	Flint	715
" 16	Moore, S.	Courtland	753
Feb. 7	Mayberry, W. C & Sons	Waverly	562
8	Moore, W. S	Perdue Hill	572
" 8	Montgomery Bros	Lincoln	575
" 8	Miller & Barnett	Berry	576
" 13	Mapes, M. A.	Phil Campbell	600
Jan. 4	McClung, F. M	Coats Bend	120
" 8	McEntine & Millard	Hanceville	144
" 9	McNaro & Pitman	Albertville	148
" 14	McKenzie, W. F.	Greenville	193
" 15	McGehee, Driver & Co	LaFayette	227
" 15	McEntyre, Henderson & Adams	Ozark	240
" 16	McGowen, W. E	Cuba	302
" 16	McDonald, T. C	Luverne	305
" 17	McClusky & Co. and Boaz Gin Mill Co	Boaz	346
" 22	McMillan & Harrison	Mobile	413
" 25	McEntire Bros	Cullman	466
Feb'y. 4	McCallet, James E	Deposit	535
" 4	McCluney & Miller	Coats Bend	538
" 7	Mackentepe, J. W. & Son	Cullmaan	569
" 16	McWorter, A. J	Stricklin	624
" 20	McIntyre & Sellers	Ashford	655
Mch. 5	McEntyre, T. H. & Co	Coffee Springs	679
" 7	McCrackin & Baker	Berry Station	698
" 28	McQueen, J. S. & Co	Greenville	773
1900			
Oct. 3	N. O. Acid and Fertilizer Company	New Orleans, La	16
Nov. 3	Navassa Guano Co	Wilmington, N. C.	43
Dec 24	National Fertilizer Co.	Nashville, Tenn	84
1901			
Jan. 3	Newman, Robert	Abbeville	103
May 15	Neighbors, J. A. & Co	Goodwater	264
" 9	Neighbors. T. L. & Bros	Goodwater	152
" 15	Newton, W. F	Dothan	221
" 16	Nichols, J. A.	Childersburg	286
" 21	Nation & Pate	Liberty	407
Jan. 21	Noble, M	Avery	408
" 29	Northcutt. J. A	Winfield	491
Feb'y. 1	Newton, W. M	Bellville	513

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Date of Issue.	Name.	P. O. Address.	No. of Licenses.
1901			
Feb'y. 7	Nolan Bros	Alexander City	556
" 16	Nelson, Mrs. A. B	Walnut Grove	622
" 16	Nixon, W. D	Merrellton	626
" 2?	Neher, E. J	Holleywood	648
Mch. 12	Nettles, T. A	Kempville	725
" 15	Nicholson, L. S	Collinsville	736
" 25	Norwood & Co	Ft. Deposit	765
" 30	Nix, Thomas	Travis	778
1900			
Oct. 3	Old Dominion Guano Co	Atlanta, Ga	15
" 3	Opelika Chemical Co	Opelika	20
" 30	Ozark C. S. Oil Mill Fert. Co	Ozark	38
1901			
Jan. 14	Ober, G. & Sons Co	Baltimore, Md	185
" 16	Oakley, W. F	Columbia	290
" 17	Ogletree, T. W	Eastaboga	337
" 18	Overton, E. A	Huntsville	363
" 19	Ogden, F. & Sons	Sulligent	381
Jan. 2	Oldfield, John M	Hazel Green	410
Feb. 14	Oliver, J. M	Dadeville	618
Mch 11	Overstreet, W. W	Greensboro	719
1900			
Nov. 2	Patrick, P. A	Florence	41
Dec. 29	Perryman, Bros	Heflin	90
1901			
May 2	Presswood, J. A	Andalusia	100
" 4	Pilcher, Geo. W	Dothan	110
" 5	Pinkard, E. M	Clanton	124
" 9	Pittman, A. J	Wehadkee	150
" 9	Pilcher, W. C	Dothan	154
" 10	Patton & Archibald	Foster	158
" 11	Phillips, J. R. & Co	Bear Creek	170
" 14	Pridley, W. G	Sulligent	180
" 14	Pinkston, J. C	Shorter	195
" 15	Planters and Merchants Bank	Ozark	220
" 15	Platt and Long	Kennedy	244
" 15	Phillips Bros	Oxford	260
" 15	Pacific Guano Co	Charleston, S. C	266
" 15	Patapsco Guano Co	Baltimore, Md	267
Jan. 16	Parish, T. R. & Bros	Clayton	275
" 16	Pope, J. F. & Co	Vincent	289
" 16	Parker, James M	Equality	297
" 16	Pearce, J. P, Son & Co	Carbon Hill	309
" 16	Pearson, H. W	Alexander City	311
" 17	Planters Warehouse and Commission Co	Eutaw	326
" 18	Patterson, M. F. & Son	Falkville	356
" 18	Pope, G. W. & Co	Luverne	367
" 19	Perkins, Jr., W. W. Estate	Springville	378
" 21	Phillips & Goddard	Clarence	393
" 21	Porter & Foster	Town Creek	412

LICENSES—Continued.

Date of Issue.	Name.	P. O. Address.	No. of License.
1901			
Jan. 25	Porter, C. J & Co	Jacksonville	464
.. 26	Perry, W. C	Seale	471
.. 26	Pearce, Jim & Co	Guin	475
.. 30	Pierce, W. S. & Co.	Louisville	503
.. 31	Pope, J. F	Wilsonville	504
. 31	Pearce, J. M	Pearce's Mill	508
Feb. 1	Prattville Mercantile Co	Prattville	521
.. 8	Pride, W. G. & Bro	Madison	568
.. 9	Pope, M. F	Fayetteville	580
.. 3	Payne, J. M	New Market	597
.. 3	Probst Bros	Fayette	608
.. 16	Patterson, J. B	Mid	628
.. 16	Pressly & Co	Springville	631
.. 26	Peacock, S. D	Garland	672
Mch. 5	Pilley, R. L	Georgiana	681
.. 5	Patterson Bros	Pine Apple	687
.. 5	Porter & Stewart	Munford	689
.. 8	Pridgen, J M	Key	702
.. 9	Pruett & Pruett	Goodwater	711
.. 12	Pully, C. H. & Co	Huntsville	723
.. 16	Pitts, W. M	Union Springs	742
. 26	Phillips, J. P. & Co	Ashville	766
Apl. 17	Penny, M F	Hoke's Bluff	797
May 5	Parker, C. C. & Co	Albertville	810
.. 18	Pepper, W. J	Phil Campbell	814
1900			
Oct. 22	Read Phosphate Co	Nashville, Tenn	33
Nov. 8	Rasin-Monumental Co	Baltimore, Md	44
Dec. 3	Rome Guano Co	Rome, Ga	57
1901			
Jan. 2	Rainer Bros	Troy	98
.. 4	Rogers, J. W	Burleson	116
.. 7	Rhodes & Bro	Georgiana	128
.. 7	Riddle, A J. & Son	Arab	134
.. 7	Rouse, L. D	Wetumpka	137
.. 9	Reynolds, H. C. & W. B	Centreville	151
.. 9	Robertson & Floyd	Opelika	153
.. 10	Rice & Russell	Arab	164
.. 14	Riddle, D. H	Goodwater	181
.. 15	Riddle, S. W. & Co	Gadsden	215
.. 16	Rhodes Mill & Mercantile Co., The N. M.	Shell	299
.. 17	Ramage, Jas. T	Brundidge	335
.. 18	Reynolds Bros	Jemison	361
.. 19	Russell, R A. & Co	Gaylesville	373
.. 19	Reaves, Launders & Co	Heflin	384
.. 21	Russell Bros	Attalla	394
.. 22	Rainer, S. P	Union Springs	429
.. 24	Roe, S. N	Elba	452
.. 24	Reynolds, E. H	Notasulga	458
.. 25	Riley, F. M	Riley	463

LICENSES—Continued.

Date of Issue.		Name.	P. O. Address.	No. of License.
1901				
Jan.	28	Read & Co	Edwardsville	472
..	29	Reynolds, J. F	Nottingham	490
..	30	Rigsby & Camp	Phil Campbell	494
..	30	Randall & Son	Daphne	499
Feb.	1	Robertson, Robt. C	Fayette	510
..	1	Ryan & Co	McGuinn	518
..	13	Rentz & Turner	Thomasville	593
..	19	Robertson, Jas. R. & Son	Cropwell	633
..	19	Roberts, G. W	Collinsville	645
..	20	Russell, W. W	Fort Payne	649
..	23	Ranschenburg, C. F	Spruce Pine	664
Mch.	8	Rodgers, T S,	Morris	701
..	9	Rice, C. E	North Port	713
..	11	Reynolds, H. C & W. B	Blocton	716
..	11	Reynolds, Walker	Rendalia	724
..	12	Roberts, J. E	Pleasant Gap	739
..	16	Rosser & Johnson	Dadeville	745
..	21	Roberts, W. I	Fayette	759
..	22	Roy, J. D	Deatsville	763
..	26	Robbins & McGowan Co	Brewton	767
1900				
Oct.	3	Stumpe, J. M	Florence	1
..	3	Swift Fertilizer Works	Atlanta, Ga	12
..	3	Standard Guano & Chemical Mfg. Co	New Orleans, La	17
Dec.	10	Smith, R. H	Collinsville	62
..	15	Stewart, W. A	Dawson	71
..	17	Savannah Guano Co.	Savannah, Ga	72
..	21	Sanders, J. G. & John	Dothan	79
..	22	Stokes, R. E	Abbeville	83
..	28	Snead, J. H	Boaz	89
1901				
Jan.	3	Snead, Jas. E	Snead	105
..	4	Sellers & Orum	Montgomery	119
..	7	Schuessler & Co	Roanoke	132
..	8	Stiefelmeyer, C. A	Cullman	142
..	10	Snead, C. E. & Bro	Boaz	160
..	14	Smitherman, H. M	Goodwater	182
..	14	Smith Bros. & Co	Warrenten	186
..	14	Stiefelmeyer, C. A	Hanceville	187
..	14	Stewart, S. E	Hartselle	188
..	15	Stephens, S. B	Petrey	208
..	15	Schloss & Kahn	Montgomery	210
..	15	Sellers, W. R	Troy	223
..	15	Savage, Chas. B	Evergreeen	226
..	15	Sturkie & Duke	Gadsden	229
..	15	Shepherd, Z	Georgiana	242
..	15	Sanders, G. A. & Son	Luverne	257
..	16	Stewart, T. F	Spring Garden	288
..	16	Schiffman, S. & Co	Huntsville	301
..	16	Sibert, W. J	Gadsden	308

LICENSES—Continued.

Date of Issue.		Name.	P. O. Address.	No. of License.
1901				
Jan.	16	Scholze & Bro	Chattanooga, Tenn	312
"	17	Simms & Bro	Blountsville, Ala	315
"	17	Spraggins, J. R	Hackleburg	318
"	17	Shorter, E. S. & Co	Eufaula	324
"	17	Shipp & Co	Albertville	328
"	17	Stanley Bros	Jasper	331
"	17	Scarborough, W. A. & Co	White Plains	332
"	17	Shellmet N. S	Welsh	340
"	18	Storey, The A. G. Mercantile Co	Talladega	353
"	18	Snodgrass, J. D	Scottsboro	360
"	18	Sanders & Son	Columbia	362
"	19	Smith, J. W	Cooper	377
"	19	Smith, M. S	Selma	385
"	22	Smith & Davis	Fort Payne	426
"	23	Schuessler Bros	LaFayette	436
"	23	Selman & Co	Albertville	437
"	24	Self, E	Selfville	454
"	24	Smith, G. H	Ealums	456
"	25	Sellers, C. W. & Sons	Inverness	459
"	26	Stark, W. E	Seale	470
"	28	Stokes, Sessions & Co	Ozark	485
Feb.	1	Sessions & Mizell	Enterprise	516
"	4	Strock, W. H	Verbena	527
"	5	Stephens, T. H. & H. B	Seaborn	544
"	6	Stonacher, F. W	Luttrell	549
"	7	Schwab Jonas Co	Birmingham	550
"	6	Smith, E S	Argo	552
"	7	Stringfellow, E. M	Reform	560
"	8	Shreve Bros	Andalusia	567
"	13	Smith, Fred	Steels Depot	601
"	19	Smith, M. L	Dadeville	634
"	19	Shaw, W. A	Winfield	641
"	19	Sellman, A. J	Albertville	644
"	22	Stewart, Formby & Co	Piedmont	657
"	22	Sampy, W. L	Gadsden	658
"	22	Sims, J F	Brompton	662
"	22	Stewart & Hazlewood	Eden	663
"	24	Stanford & Collins	Crews Depot	665
Mch.	12	Sellers, R. D. & Son	Omega	728
"	12	Smith, H. B	Yancey	730
"	14	Searight Mercantile Co	Searight	735
"	30	Smith Bros	Sylacauga	776
"	30	Stewart, T O	Munford	777
Apr.	2	Scott, G. G	Mt. Pleasant	782
"	5	Stewart, B. M. & J. E	Spring Garden	788
"	6	Stone, J. A	Alexis	790
Feb.	17	Skelton, R. S	Scottsboro	798
May	8	Snow, P. H. & J. T. Mosely	Boaz	813
1900				
Oct.	5	Tennessee Chemical Co	Nashville, Tenn	6

LICENSES—Continued.

Date of Issue.	[N]AME.	P. O. ADDRESS.	No of License.
1900			
Oct. 5	Troy Fertilizer Co	Troy	21
" 18	Tallapoosa Oil Co	Alexander City	31
" 8	Thompson & Kelley	Normal	23
Nov. 2	Tennessee Valley Fertilizer Co	Florence	42
" 5	Trawick & Jernigan	Opelika	45
" 14	Talladega Fertilizer Co	Talladega	49
Dec. 24	Tuscaloosa Cotton Seed Oil Co	Tuscaloosa	85
1901			
Jan. 10	Thomas Bros	Alexander City	157
" 11	Tucker, Willingham & Co	Lafayette	171
" 14	Talley, J. T	Roanoke	190
" 14	Thornton, E. L., Manager	Mountain Creek	196
" 15	Thornton, B. E	Gordo	214
" 15	Turnipseed, W. O	Oxford	259
" 16	Truss, Geo. M. & Co	Springville	273
" 18	Thomas, W. C. & Co	Gold Hill	357
" 19	Teague, S. F	Birmingham	376
" 25	Thomasville Mercantile Co	Thomasville	461
" 26	Thompson, W. C	Hartselle	474
Feb. 1	Thompson, W. C. & Co	Prattville	520
" 4	Talley, Dyer N	Trussville	539
" 7	Towers, W. W	Maple Grove	557
" 8	Thompson, C. W	Tuskegee	566
" 13	Tisdale, W. R	Andalusia	599
" 14	Tabor, Jno. T. & Co	Keener	619
" 19	Teague Bros	Ashville	640
" 20	Thomas & Barwick	Oneonta	651
Mch. 5	Terry, A. T. & Son	Forney	691
" 11	Taylor, G. W	Huckabee	722
" 26	Toney, Harris	Swancott	768
" 26	Trammell & Co	Roanoke	770
1900			
Nov. 26	Union Fertilizer Co	Atlanta, Ga	56
1901			
Feb. 13	Usry, O. E	Hebron, Ala	603
1900			
Oct. 3	Virginia and Carolina Chemical Co	Atlanta, Ga	3
" 11	Virginia and Carolina Chemical Co	Newnan, Ga	27
Nov. 5	Vandiver & Co., W. F	Montgomery	46
1901			
Jan. 15	Vandegrift, A. B. & Son	Birmingham	251
" 16	Virginia and Carolina Chemical Co	Charleston, S. C	274
" 16	Vaughn, W. B	Elkmont	280
" 16	Vinson Banking Co	Georgiana	293
1900			
Oct. 3	Winston, J H	Jenifer	18
Nov. 16	Winkler, A. G	Greenville	52
" 19	West & McMurry	Roanoke	54
1901			
Jan. 4	Wright, Henderson & Co	Elba	118

LICENSES—Continued.

Date of Issue.		Name.	P. O. Address.	No. of License.
1901.				
Jan.	5	White & Awbrey	Roanoke	122
..	8	Wood, N. W	Collinsville	141
..	8	Wood, W. J	Abbeville	143
..	9	Williams. T. B	Cullman	155
..	10	Wilhite, W. B	Hartselle	156
..	10	Webb, Jno. C	Demopolis	159
..	11	Walker, Rushton & Co	Rutledge	165
..	21	Walker, J. E	Alexander City	176
..	14	Weathers, Swann & Co	Roanoke,	207
..	15	Warten, Henry	Athens	213
..	15	White & Edmonson	Troy	219
..	15	Woodward, J. B	Talladega	232
..	15	Wilder, R. M	Brantley	248
..	15	Ward, W L & Son	Selma	263
..	16	Windham. W. C	Troy	268
..	16	Warnock & Sons	Oxford	276
..	16	Whaley, Monroe	Blountsville	283
..	16	Woolf, John P	Piedmont	285
..	17	Wright, A. R	Farill	321
..	17	White, J. B. & Co	Talladega	330
..	18	White & Spigener	Goodwater	352
..	18	Weil, M. H. & Co	Huntsville	366
..	19	Walker & Ashcraft	Kennedy	374
..	21	Willis, J. J. S	Mt. Andrew	411
..	22	Webb & Morgan	Langston	417
..	22	Whitehead, J. B	Winfield	422
..	22	Watkins, F	Opelika	423
..	22	White, M A	Attalla	427
..	28	Westmoreland, J. E. F	Florence	479
..	29	Walker, J. H	Wolf Creek	492
..	31	Williams, P	Lebannon	505
Feb.	2	Welden, R. G. & Co	Wilsonville	524
..	4	Wilder, A C. & Co	Vincent	530
..	4	Welch & Co., Wm	Alexander City	540
..	8	Winn & Son	Clayton	574
..	9	Waite & Maddox	Easonville	583
..	9	Wood, R. R	Childersburg	585
..	9	Wise, G. W	Madison	586
..	13	Wilson & Co	Russelville	609
..	14	Walker, F. M	Dadeville	616
..	14	Williamson, F. F. & Son	Opelika	620
..	19	Walls, H. D	Grant	639
..	23	Woodall, A, W	Springville	668
..	28	Wood & Hattemer	Fort Deposit	674
Mch.	5	Ward, H. B	Cuba	680
..	5	Windham & Ennis	Hillsboro	693
..	7	Wallace, S. H	Klein	699
..	9	Williams, Pinkney	Lebanon	706
..	9	Walkley, D. W	Wetumpka	712

LICENSES—Continued.

Date of Issue.	Name.	P, O. Address.	No. of License.
1901.			
Mch. 11	Wilson, W. M. & Bro	Clanton	720
" 11	Walker, J. T. & J. B	Plevna	737
" 11	Wilson, J. C. & Son	Lincoln	751
" 11	Williams, J. S	Pansey	752
" 11	Winter, Loeb & Co	Montgomery	764
" 11	Waldrip, J. R	Hanover	769
" 11	White, J. W. Bros	Clayton	783
" 11	Windham & Co	Moulton	793
" 11	Wedgeworth, Walter E	Akron	801
" 11	Wedgeworth, Will M	Greenwood	802

FERTILIZER LAWS.

PROVISIONS REGULATING THE SALE OF FERTILIZERS.

378 (139). *Sale or exchange of commercial fertilizers; license required.*—Commercial fertilizers must not be sold or exchanged without a license from the commissioner authorizing the person making the sale or exchange to deal therein. All sales or exchanges made without such license are void.

See citations to section 386 (141).

379 (140). *License; fee; duration.*—On the payment of a fee of one dollar, the commissioner must issue license to any person or firm, or corporation, or association of persons, authorizing the sale or exchange of fertilizers during a season, expiring on the thirtieth day of September of each year.

380. *Evidence.*—The printed report of a commissioner or a certified copy of the record in his office showing the issuance of a license to sell or exchange commercial fertilizers, and to whom and when issued, is presumptive evidence of the fact that such license was issued to such person at such date. But this provision does not preclude the introduction of the license in evidence.

336 (141). *Dealer must attach tags, else sales or exchange void.*—Before selling or exchanging, or offering to sell or exchange fertilizers, the licensees must attach one of such tags to each bag, barrel or package containing two hundred pounds or any less number of pounds; two tags to each bag, barrel or package containing more than two hundred pounds and not more than four hundred pounds, and one additional tag for each additional two hundred pounds or fractional part thereof, contained in such bag, barrel or package; and a sale or exchange of fertilizers not so tagged is void.

A sale of commercial fertilizers, made in violation of statutory requirements, is void, and no recovery can be had for the price.—Campbell v. Segers, 81 Ala. 59; Steiner v. Ray, 84 Ala. 93; Clark's Cove Guano Co., v. Dowling, 85 Ala. 142; Merriam v. Knox, 99 Ala. 93; Brown v. Adair, 104 Ala. 652; Kirby v. Huntsville Fertilizer & Milling Co., 105 Ala. 529.

When contract of sale made in this State.—Johnson v. Hanover Nat. Bank, 88 Ala. 271; Hanover Nat. Bank v. Johnson, 90 Ala. 549; Brown v. Adair, 104 Ala. 652.

Residence of sellers and place of manufacture of goods are immaterial when delivery made in this State.—Merriman v. Knox, 99 Ala. 93; Brown v. Adair, 104 Ala. 652.

Tags must be attached at the time of the sale; if previously attached, and lost before the sale. others must be supplied, else the sale is void. Clark's Cove Guano Co. v. Dowling, 85 Ala., 142; Kirby v. Huntsville F. & M. Co., 105 Ala., 529.

Action on commercial paper given for the price of fertilizers sold without compliance with statutory requirements cannot be maintained, even by a bona fide purchaser before maturity.—Hanover Nat. Bank v. Johnson, 90 Ala. 549.

When want of license pleaded, burden of proof on plaintiff.—Edisto Phosphate Co. v. Sanford, 112 Ala. 493.

387. *Including tag tax in price of fertilizer vitiates sale.*—Whenever any manufacturer, merchant or other person selling fertilizers shall, directly or indirectly, include such tag tax in the price of the fertilizer sold, such sale is void.

388. *Contracts for sale of fertilizers at fictitious prices; only real market value recoverable.*—In contracts for the sale of fertilizers in which an excessive or fictitious price is put upon such fertilizers with the stipulation that if such fertilizers are paid for on or before a certain date they may be paid for in a smaller sum than such excessive or fictitious price, or in cotton or other produce at an excessive or fictitious price, the difference between the excessive or fictitious price charged for the fertilizers and their real market value shall be held a penalty; and in all suits to enforce such contracts only the real market value of such fertilizers, with the interest thereon, shall be recovered.

38. *Parol evidence competent.*—Parol evidence is competent to show such market price, the situation of the parties and the consideration of such contracts, as in cases of usury, notwithstanding any writing in the premises.

390. (42). *Fertilizers to be submitted to commission.*—Before offering a fertilizer for sale or exchange, the person proposing to sell or exchange must submit to a commissioner a written or printed statement, setting forth—

1. The name and brand under which such fertilizer is to be sold or exchanged, the number of pounds contained in the bag, barrel or package, in which it is to be put upon the market, the name or names of the manufacturers, and the place of manufacturing.

2. A statement setting forth the amount of the named ingredients which they are willing to guarantee such fertilizers to contain: First, nitrogen; second, water soluble phosphoric acid; third, citrate soluble phosphoric acid; fourth, acid soluble phosphoric acid; fifth, potash; and such statement shall be held to constitute a guarantee to the purchaser that every package of such fertilizer contains not less than the amount of each ingredient set forth in the statement, and when such statement sets forth the maximum and minimum of any ingredient, the commercial value shall be estimated upon the minimum alone; but this shall not preclude the party from setting forth any other ingredients which the fertilizer may contain, which as well as the preceding, shall be embraced in the guarantee.

See citation to section 386 (141).

391 (143). *Fertilizers or chemicals for manufacturing to be branded.*—All fertilizers or chemicals for manufacturing or composting the same, offered for sale, exchange or distribution, must have branded upon, or attached to each bag, barrel or package, in such manner as the commissioner may by regulation establish, the true analysis of such fertilizers or chemicals, as claimed by the manufacturer, showing the percentage of valuable elements or ingredients such fertilizer or chemical contains, and its commercial value, calculated upon the standard value of the principal ingredients as set forth in the preceding section as priced by the commissioner of agriculture at the beginning of each season, and in every case the brand must specifically set forth the percentage contained in the fertilizer section, in the terms of that section.

392 (144). *Fertilizers; what not included in term.*—The term "fertilizer," or "commercial fertilizer," used in this chapter, does not include common lime, land plaster, cotton seed meal, ashes, or common salt not in combination.

393 (145). *Chemist of department.*—The professor of chemistry of the Agricultural and Mechanical College is the official chemist of the department. On the application of the commissioner he must analyze and certify the analysis of all fertilizers, samples of which are furnished him; and, at the request of the commissioner, if he can without conflict with his duties as professor, must attend conventions of agricultural chemists, make reports of such matters as he may deem of interest to the department, and render such other services in the line of his profession as the commissioner may require.

394 (146). *Compensation of Chemist.*—The chemist is entitled to

his necessary travelling expenses while on duty assigned to him by the commissioner, payable from the funds of the department as provided in the next article.

395 (147). *Copy of official analysis evidence.*—The copy of the official analysis of any fertilizer or chemical, under the seal of the department of agriculture, shall be admissable as evidence in any of the courts of the State. on the trial of any issue involving the merits of such fertilizer or chemical.

CRIMINAL LAWS.

SECTION 4153.—*Dealing in fertilizers without submitting statement to Commissioner.*—Any person who manufactures or exchanges, sells or offers for sale or exchange, any fertilizer without first submitting the statement required by law to the Commissioner of Agriculture, must, on conviction, be fined not more than five hundred dollars for each offense.

SEC. 4154. *Selling fertilizers without attaching proper tags* —Any person who sells, exchanges or offers for sale or exchange, any bag, package or barrel of fertilizer which has not been tagged as provided by law, must on conviction, be fined not less than fifty dollars for each offense.

SEC. 4155. *Using more than once, and counterfeiting tags.*—Any person who counterfeits the tags prepared by the Commissioner of Agriculture, knowingly, or who uses a counterfeit of such tag, or who uses a second time a genuine tag, or who uses the tag of a former season, must, on conviction, be fine one hundred dollars.

SEC 4156 *Making false certificate of analysis of fertilizers.*—Any chemist, who wilfully makes a false certificate of the analysis, or of the ingredients of any fertilizer intended or offered for sale or exchange, must on convictian, be imprisoned in the penitentiary for not less than two, nor more than five years.

SEC. 4157. *Dealing in commercial fertilizers without license.*—Any person who sells or exchanges fertilizers without having obtained a license from the Commissioner of Agriculture, as provided by law, must, on conviction, be fined not less than one hundred dollars for each offense.

SEC. 4158. *Fraud in manufacture, sale or exchange fertilizer.*—Any person who commits a fraud in the manufacture, sale or exchange of any fertilizer, or of the ingredients of a fertilizer, must, on conviction, be fined not less than one hundred dolars for each offense.

Special attention is called to the following rules for branding bags for the season of 1901-2.

The words "GUARANTEED ANALYSIS" must be in letters not less than one inch in height. The word "ALABAMA" must be in letters (all capitals) not less than one and one-half (1½) inches, and the balance of the guarantee, including the commercial value, must be in letters and figures not less than three quarters (¾) of an inch in height.

When the minimum and maximum guarantee is gixen, the commercial value must be calculated *upon the minimum alone*.

In computing the value of the commercial fertilizers the laws of Alabama only recognize the following ingredients: Nitrogen, Water Soluble, Phosphoric Acid, Citrate Soluble, Phosphoric Acid and Potash.

In making your calculations to determine the commercial value, you will confine yourself to the foregoing ingredients and to the following values:

Water Soluble Phosphoric Acid 5 cents per pound.
Citrate Soluble Phosphoric Acid 5 cents per pound.
Nitrogen .... 16 cents per pound.
Potash (K 2 O).... .... 6½ cents per pound.

I would respectfully call your attention to the fact that it is the opinion of our Attorney-General that every Fertilizer Dealer or Manufacturer who sells goods in this State must obtain a license before offering their goods for sale. Failure to obtain such license not only makes the sale void and the debt non-collectible, but subjects the seller to a fine of one hundred dollars for each sale made. The license fee is only one dollar. The fertilizer season runs from October to October, and I would suggest that you send for your license at the *beginning* of the season.

ALL COMMERCIAL FERTILIZERS MUST BE ANALYZED BY THE STATE CHEMIST.

AN ACT

To Amend Subdivision 18, Section 147 of the Code.

Section 1. *Be it enacted by the General Assembly of Alabama*, That subdivision eighteen of section one hundred and thirty-seven of the Code be amended so as to read as follows: It shall be the duty of the Commissioner of Agriculture to obtain samples of each and every brand of fertilizers sold and exchanged, or offered for sale or exchange, in this State, for each season in which such fertilizers are offered for sale, and cause such samples to be analyzed by the

State Chemist; and make publication of such analysis not later than August 1st of each year; *Provided*, that the provisions of this act shall not take effect until after September 1, 1891.

HOW SAMPLES SHALL BE DRAWN.

Special attention is called to the following rules for sending samples of Fertilizers to have analyzed. Farmers and others sending fertilizers for analysis must observe the following directions:

In order to secure a representative sample of fertilizers to be analyzed, a small amount of material should be removed from the interior of of a number of sacks and the samples thus obtained should be thoroughly mixed in order to secure uniformity. At least 6 or 8 ozs. of the material are then placed in a wide mouth glass bottle, which is then sealed and properly labeled. In the case of ton lots of fertilizers, at least every third sack should be sampled in order to secure a final sample, which will approximately represent the whole lot.

The sample should be drawn in the presence of two reliable witnesses and the label attached to the bottle should contain the name of the manufacturer and the name of the goods as taken from the bag in which the fertilizer is sold.

The sample is shipped to Commissioner of Agriculture, at Montgomery, Ala., with transportation prepaid, to be forwarded to the State Chemist at Auburn, Ala.

TO FERTILIZER MANUFACTURERS AND DEALERS.

In accordance with the provisions of Bulletin 11, page 105, no sample of fertilizers for official analysis will be received by this department until further notice, from manufacturers direct, except in the case of manufacturers within the State, who are licensed dealers and sell direct to consumers.

Such manufacturers can supply samples for analysis under the same terms as dealers, provided such samples are taken from large lots of goods as manufactured for the trade; and provided, further, that only one representative sample of each brand shall be submitted for analysis by any given manufacturer, said samples being forwarded for analysis not earlier than December 1st.

Samples of the various brands offered for sale in this State will be obtained chiefly from dealers and consumers, and only from manufacturers when specially requested by this department, and such samples should be taken from goods as actually in stock after commencement of the fertilizer season.

Manufacturers who desire to secure analysis of samples drawn and forwarded by themselves, can have such analysis made at a moderate cost by forwarding samples direct to the State Chemist at Auburn, Ala.

R. R. POOLE,
Commissioner of Agriculture.

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ALABAMA.

Agricultural Experiment Station

OF THE

AGRICULTURAL AND MECHANICAL COLLEGE,

AUBURN.

Texas or Acclimation Fever.

By C. A CARY.

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NOTICE.

Bulletin No. 115 treats of the chemical analysis of commercial fertilizers made by the Chemist for the State Department of Agriculture. Since the bulletin is issued by the Department in large number and generally distributed among the farmers of Alabama, the Experiment Station has printed a limited edition for its own use, and copies will only be sent to the Station Libraries and the Directors of the Stations and a few other parties who are keeping files of the Bulletins for binding. But Bulletin 115 will be sent to any person applying for it until the issue is exhausted.

P. H. MELL, *Director.*

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TEXAS OR ACCLIMATION FEVER,

By C. A. Cary.

INTRODUCTION.

The cattle breeding industry of the South has been held in check by the fact that Northern-bred and imported cattle could not be brought into the South without running great and unprofitable risks. In fact, the danger of losing such cattle was so great as to prevent or prohibit bringing fresh and imported strains of breeding animals into the infected regions of the South. As a result of this natural barrier, few beef-bred cattle came to improve the scrub stock or to improve the animals that had a tinge of Jersey blood in them. Possibly Jersey blood is more widely scattered among the native scrub cattle of the South than that of any other breed. Consequently, with a well-bred Jersey bull to head a herd, one could soon develop a respectable and profitable herd of grade Jerseys by using such a bull upon selected native Southern-bred cows. But none of the native Southern cattle have beef tendencies. Most of them do not mature until six or seven years old, and when mature they are too small for profitable beef animals—especially for shipping to distant markets. Beef animals must mature before they are three years old or they are not profitable.

The necessity for animal industry, especially cattle raising—is fast dawning upon the farmer of the South. It leads to diversified farming; it decreases the demand for commercial fertilizers by supplying larger quantities of manurial fertilizers that can be made upon the farm and are far better than commercial fertilizers, because they are cheaper, and more permanently improve soil, both in mechanical condition and in available plant food. Feeding animals upon the farm and saving the liquid and solid manures gives the farmer a double use of the feed stuffs produced on the farm; because the manurial products contain from 60 to 90 per cent. of all the fertilizing materials that were found in the feeds that were fed the animals. For example: Cotton seed hulls and cotton seed meal lose but very little of their value as fertilizers by feeding them to cattle, providing the the liquid and solid manures coming from the animal are properly saved and utilized. The cattle industry does not mean that we shall not raise cotton, but that we can raise as much or more cotton than we do now upon less acreage and with less work and less expense for fertilizers.

During the past three years more beef-bred animals have been brought into the State of Alabama than during any previous time in its history. Unfortunately, some of them have been lost by acclimation or Texas fever; but the larger number of them have been saved by careful handling. Methods of acclimating or immunizing Northern-bred or foreign-bred cattle have been developed so that the dangers of acclimation have been reduced to the minimum—so that it is no longer unprofitable to bring into the South highly-bred breeding animals.

The chief object of this bulletin is to describe the methods of immunizing susceptible cattle to Texas fever, and give the records that have been made at this station and others by using the improved methods of immunizing Northern and foreign-bred cattle.

WHAT IS TEXAS FEVER?

In various parts of the country this disease is known by different names; it has been called Texas fever, acclimating fever, Southern fever, tick fever, Spanish fever, red water, hæmaturia, black water, murrain, dry murrain, yellow murrain, bloody murrain, hollow-horn and hollow-tail.

Texas fever is caused by a very small animal parasite (*Pyrosoma bigeminum*, Smith) which was discovered by Theobald Smith in 1889. Its chief place of living is in the red blood cells of cattle. In some condition it lives in the cattle tick and is carried from immune cattle or cattle sick with Texas fever, to non-immune or susceptible cattle by the tick. In this transmission of the microparasite from the diseased to the healthy animals, it passes through two generations of ticks. The female tick abstracts blood from its host; falls to the ground, deposits a large number of eggs that hatch in 14 to 45 days, and the young seed ticks get upon susceptible cattle and inoculate them. In many cases the fever appears in the cattle about the time the young ticks molt the second time; then the young ticks are about one-eighth of an inch long, and the careless observer may declare there are no ticks on the animal sick with Texas fever. It may be here stated that this micro-parasite has two hosts (cattle and ticks of two generations) and possibly can not live anywhere outside these two hosts. At least its existence in other hosts or places have not been discovered. In some respects it resembles the malerial parasite of man, but its stages of development, are not as well known as those of the malerial miscro-parasite. Yet some things are known of its form and life history in the red blood cells of cattle, and in the plasma of the blood. In mild cases of

Texas fever the micro-parasite appears as a single round body in the red cell near the preriphery or the outer border. Sometimes there may be two of these round bodies in a single red cell of the blood. Occasionally the small round bodies may appear singly or in pairs in the plasma of the blood. In severe cases that usually occur in hot weather and when the temperature of the animal is high, there may be two spindle or pear-shaped bodies in one red cell of the blood. According to Smith, 5 to 50 per cent. of the red cells of the blood may contain these micro-parasites—the number of red cells infected will vary with the type (mild or acute) of the fever. The number of red cells infected will also vary with the different organs from which the boold is taken for microscopic examination. Blood from the capillaries of the liver, heart-muscle, and kidneys, contain from 20 to 90 per cent. of infected red blood cells; while the blood from the capillaries of skeletal or voluntary muscles and the skin may contain very few (10 per cent. or less) infected red blood cells.

Fresh or dried smears of blood may be examined under the microscope. For fresh smears collect a small amount of blood with platinum loop; place it in the center of a clean cover glass; drop the cover glass, blood side down, upon a clean slide and surround the cover glass with vaseline or paraffine; the mount is now ready for examination under the microscope. In making dried smears, take two clean square cover glasses; place a small drop of blood (picked up with the platinum loop) on one of the clean squares a little to one side of the center, and with another clean square spread the droplet of blood over the lower cover glass by attempting to scrape off the droplet with one edge of the upper cover glass, holding the upper one in the right hand inclined at an angle of about 20 degrees, with the lower one that is held between the thumb and finger of the left hand. Dry the smears immediately after making them, and place them in the hot air oven, keeping them there for one and one-half to two hours, at a temperature 110 to 120 degrees C. Stain the smears with Lœffler's alkaline methyl blue from one to one and one-half minûtes; wash in water and dip for an instant into a one-third per cent. acetic acid solution to remove excess of diffuse stain in the red blood cells; wash in water and mount in water or dry and mount in xyol balsam. Examine with a high power objective. (Smith's method.)

The **CHANGES** that **OCCUR IN THE BLOOD** are very characteristic in a case of Texas fever. Red blood cells in great numbers are destroyed by the micro-parasite. This is determined by actual count of the red blood cells in a definite quantity of blood; the test being made before, during and after or following the fever. In healthy old cattle the average number of red blood cells in a cubic millimeter is about 6,000,000. In healthy young calves the average number of red cells per cmm. may be as high as 8,000,000. In healthy mature or middle-aged cattle the average number may be about 7,000,000 per cmm. In acute cases of Texas fever the number of red cells in the blood may be reduced 2,000,000 or less per cmm. In mild cases of Texas fever the number of red cells will vary between 3,000,000 and 5,000,000 per cmm.

As associated with, or as a result of the great loss of red blood cells (anæmia) the red cells will vary in size and shape; some are very much larger than normal red blood cells and when stained with Lœffler's alkaline methyl-blue, become diffusely stained, and some of them contain very small granules. These large red cells are found in some forms of anæmia in man, and are called megalocytes.

The **UNITED STATES GOVERNMENT** has **ESTABLISHED** a **QUARANTINE LINE** which is fixed for the regulation of inter-state trade in cattle, so that Southern tick-infested cattle cannot be taken into non-tick-infested States (excep for immediate slaughter) during the warm seasons when pastures and susceptible cattle may become infected with ticks, and the latter inoculated with the micro-parasite of Texas fever. All the States, or parts of States, south of this line are in the tick-infested region, and all north of it are in the tick-free region. This line starts at the Atlantic Ocean, near the southern boundary of Virginia, runs westward, leaving nearly all of North Carolina, all of Georgia, Alabama, Mississippi, Louisiana, and Texas, part of Tennessee, Arkansas, Indian Territory, New Mexico, Arizona, and the southern part of California south of the Governmental quarantine line, in the tick-infested part of the United States.

This quarantine line and the fact that all Northern-bred cattle shipped into the South have Texas fever, have led many people to believe that Texas fever occurs only in Northern-bred cattle, and never in the native cattle of the South. But it has been proven in some cases, beyond doubt, that calves are not born immune to Texas fever even though their dams are immune. In truth, it is very probable that all cattle are born susceptible to Texas fever, and only acquire immunity after birth, by having one or more attacks of the fever. The micro-parasite in the blood of the dam can not pass into the fœtus in the uterus because the blood in the circulation of the mother does not pass directly into the circulation of the fœtus. The serum of the blood of the mother passes through membranes into the circulation of the fœtus and it is very probable that the micro-parasite does not pass through these membranes. Moreover, blood serum contains very few of the micro-parasites.

The calves that are born of immune cows and live in tick-infested lots or pastures, acquire immunity while young, by having such a mild attack of the fever that it is not observed. Possibly complete immunity is only acquired by two or more mild attacks that appear as the succeeding broods of ticks inoculate them.

Some of the calves born of immune cows escape tick infestation, and consequently escape inoculation. When full grown, or several years old, they may be taken into a tick-infested pasture or the ticks may be brought to them by introducing new cattle into the herd; then they may die of Texas fever. Many farms in Alabama are tick-free; many town lots are tick-free; parts of many farms and pastures are tick-free; consequently cattle that are bred and raised in such tick-free places are susceptible to Texas fever. Tick-free lots, pastures and farms are so made by keeping all cattle off them for one or more years, by rotation of crops and pastures, by burning the grass, by killing all the ticks on the home cattle, by stock law all the year round, and by introducing no new cattle without first completely ridding them of ticks. Ticks do not travel any great distance (a few feet only), except when upon their host; by themselves, ticks will rarely, if ever, cross a road 60 feet wide. Hence a tick-infested and tick-free farm may be very near each other and remain in that condition, providing cattle and horses are not permitted to go from one farm to the other, except when these farm animals are free of ticks. Records of losses in Alabama of native, Southern-bred cattle, from Texas fever have been reported to me every year for several years, and I have records of Texas fever occurring in Alabama-bred cattle in every season of the year. Of course the severe and fatal cases occur mostly in hot portions of the year, while most cases that occur in winter are mild. One or two illustrations may bring out some of the above-mentioned conditions. A certain dairyman had kept his cattle and farm free of ticks for several years. He bought some new cattle, which were infested with ticks, and placed them in his herd. In due time his home-raised cows began to die with what he called "red water," which was Texas fever. Another man sold his entire herd of cattle that had been kept free of ticks; these cattle were moved just a few miles, and in a short time many of them died of Texas fever. Parties who buy calves or feeders from various farms in a neighborhood, beat or county, nearly always lose several some time after the calves or feeders have been brought together in the new feeding pens or pastures.

It might be well to state here that Hunt of Australia claims that some cattle ticks do not possess the micro-parasite of Texas fever—especially in a virulent form. This might explain some of the outbreaks of Texas fever among Southern-bred cattle in herds that are collected from many different farms or pastures. But so far as I know, all ticks of this species in the United States that have been tested, have been able to transmit the micro-parasite; and no positive facts have been discovered that show that the micro-parasite will vary in its virulency. Hence we must regard all ticks of this species as carriers of the Texas fever micro-parasite.

THE SOUTHERN CATTLE TICK (*Boophilus bovis*, Riley), is said to be a native of Northern Africa, and reached the Southern States by way of Spain, South America, Central America and Mexico. The life history of this tick, as discovered by Cooper Curtice, is described as follows:

The large female tick (the one so easily observed on cattle) drops to the ground when filled with blood from its host; hides in some secluded place; lays or deposits from 1,500 to 3,000 eggs, and then dies. The incubation period, or time required for the eggs to hatch, will vary from 14 to 45 days; the length of time depends upon varying conditions of temperature and moisture. Warm weather and a little moisture shortens the period of incubation; cool weather or heavy rains prevent or retard hatching of the tick's eggs and destroy many young ticks. The small ticks fresh from the eggs are six-legged, and very lively, collecting in bunches, not unlike in appearance a mass of chicken mites. They are called "seed ticks" because they look like a small seed or because they are said to be the seed of the tick. They crawl or climb upon grass, weeds or any object near the place of hatching. Cattle passing through the grass or weeds will become infested with "seed ticks," which soon attach themselves by their mouth parts to the skin of their host. In 12 to 15 days the "seed tick" molts ("sheds its skin") and then possesses eight legs (4 pair) instead of six. A second molting occurs in from four to six days after the first, and following this second molting, the female tick very soon becomes larger than the male; the male possesses pointed shoulders, and never gets much larger after the second molting. The female engorges itself with blood from its host, and thus develops into the large, plump, fat tick that can be so easily observed upon infested cattle, and when mature drops to the ground and dies laying eggs. Thus the round of life is completed.

COULD ALABAMA OR THE ENTIRE SOUTH EXTERMINATE THIS SPECIES OF TICKS?

According to some authorities tick extermination is possible. One farm, one beat, one county can be made tick-free. Why not an entire State? If every cattle owner in Alabama would voluntarily (or by compulsion) fight for the extermination of the tick it might be accomplished in two years. But extermination would now be next to impossible in the free-range counties of Alabama. It could be much more easily accomplished in stock law counties where the cattle are not permitted to run at large during the entire year. Every cattle owner being required to keep his cattle confined to his own pastures or definite limits could, by use of dips or washes, destroy the ticks on his cattle, horses and mules. He could also change his pasture from one part of his farm to another, at least once a year, or as often as he applies some dip or wash to the cattle to kill the ticks. The best time to get rid of the ticks on the cattle is in the winter when there are very few ticks. Once getting the cattle entirely free of ticks, they could then be put in a pasture where no cattle had been for one year or more. Following this the cattle must be inspected closely once every week, and if ticks should appear again kill them with dips and washes. Three applications of a tick-destroying dip or wash should be made; the second application should be given about ten days after the first, and the third about ten days after the second. The cattle are then ready to go into the tick-free pasture. If the herd is large it would be best to construct a dipping tank large enough to immerse one animal at a time. The tank might be wholly or partly sunk into the ground, having a pen and approaching chute, and a draining platform near the exit chute. The Bureau of Animal Industry at Washington, and Dr. Francis of College Station, Texas, have used large dipping tanks, and by applying to either of them by letter, plans and methods of constructing such tanks might be secured. Beaumont oil floating on warm water in the tank could be used to destroy ticks. It is cheap, and could be applied full strength. Cotton seed oil or kerosene oil emulsion can be used, but they are more expensive than Beaumont oil. Where a farmer has only a few cattle the Beaumont oil could be applied with cotton lint or rags by putting each animal in a brake or chute and going over the animal thoroughly with the oil.

All new animals entering the herd must be made tick-free before being turned into the pasture with the herd.

What would be gained by having Alabama or the entire South free of ticks?

The most important advantage would be free and unrestricted cattle trade with the North, and all of Europe at all seasons of the year. You could then bring into the South cattle from the North at any season of the year without danger of loss from Texas fever. If Alabama or any Southern State were to produce "feeders" or "stockers" they could be shipped directly to the corn belt States at any season, and not be hampered by a quarantine extending from March or April until November or December. In short, the entire train of troubles coming from Texas or Southern cattle fever would be wiped out. All of this would be most desirable if all the tick-infested States would line up and completely exterminate the tick. But if one county or beat should exterminate the ticks within its borders (unless it be adjacent to the Government quarantine line), it would be in a great deal of trouble by its isolation. Unless adjacent to the quarantine line it could not ship its cattle out only at such times as could the tick-infested counties. Moreover, breeders in the tick-infested counties could not buy cattle in the tick-free county because such cattle are as susceptible to Texas fever as the Northern-bred cattle. Cattle from tick-infested counties could not be taken into a tick-free county without keeping them in quarantine until they are made tick-free by dipping, etc.

The question of extermination of the tick resolves itself into this: It is a good thing for counties of townships contiguous to the Government quarantine line to make a fight to exterminate the tick and have the quarantine linê moved South of them. But to commence in the center of a tick-infested State would only lead to trouble by increasing the number of outbreaks of Texas fever or by completely shutting off tick-free places from cattle trade with surrounding territory. I would not advise local tick extermination in Alabama except to get small pastures or places for acclimation purposes, and such places are not absolutely necessary for the new methods of acclimating Northern or foreign-bred cattle. Now this does not mean that any cattle owner should permit his cattle to become literally covered with ticks, but instead every cattle owner can keep off the excessive number of ticks and yet have a sufficient number of ticks to keep his cattle immune and to permit the calves to acquire immunity. No doubt excessive tick infestation retards the growth and development of beef cattle, and also the milk-producing capacity of the milch cow.

HOW TO RECOGNIZE AND DISTINGUISH TEXAS FEVER IN THE LIVING ANIMAL.

1. Learn the history of the diseased cattle. Were they bred and raised in a tick-infested or a tick-free region? Were new ticky cattle brought into the herd, or were the sick cattle put into a new pasture where ticks are present, either upon cattle or in the pasture? Look carefully for the small ticks upon the sick cattle. It takes an inexperienced person some time to find the small, young ticks. In some cases the ticks may have

been entirely or partially removed by use of oils or drugs or dips, but not until after the ticks had inoculated the animal.

2. The temperature of a tick-inoculated animal may rise before any other symptoms are observed. In mild cases the temperature will range between 103 and 105; in severe cases it may vary from 105 to 108 degrees Fah. The temperature may remain above normal a few days then drop to normal (102) for a few days. In chronic cases there may be variable or regular periods of alternate rising and falling of the sick animal's temperature. (See Admiral's temperature record in Table No. II.)

3. In mild cases the appetite is capricious or changeable. The sick animal may refuse feed at one time, and at another eat quite or nearly a normal or full feed. In acute or severe cases the appetite is entirely or almost completely lost; the sick animal may nibble at this or that feed, but will eat very little. Rumination is suspended (does not chew the cud) in all severe cases, during the high fever period, and some times until convalescence begins; this would lead some persons to claim that the animal was sick from "loss of cud."

4. At first or during the high fever period, the bowels are inactive. Loss of appetite, ceasing to ruminate and inactivity of the bowels indicate that digestion is suspended. The inactivity of the bowels may be indirectly a result of loss of red blood cells, a result of the high fever, or it may be due to congestion and sometimes inflammation of smaller or larger areas of mucous membrane lining the fourth or true stomach and of the intestines. Sometimes upon post mortem examination the mucous membrane of the fourth stomach and of intestines are found eroded or ulcerated—the membrane in small spots or patches has sloughed off. No doubt that the bowels are paralyzed, and no amount of heavy

purgatives will move them in that condition. Very probably many cases are killed by frequent doses of heavy purgatives, when small oleaginous (raw linseed oil) laxatives should be given to soothe the inflamed areas. Fermentation may be kept down by giving dram doses of creolin in one-half pint of water three or four times per day. When the animal's condition changes for the better, or begins to improve, the bowels may then become freely active; but in no case should the active bowels be checked; this will be corrected as the animal improves.

5. The respirations may be slightly accelerated, but in acute cases they are very rapid, running as high as 30 to 60 per minute. The rapid respirations are short or shallow, and in some cases are accompanied by a cough, and sometimes by groaning or grunting sounds.

6. The pulse in acute cases is rapid and as the number of red blood cells decrease, the pulse grows weaker. The weakness of heart and blood vessels and general muscular weakness cause the patient to lie down much of the time. When it attempts to walk the gait is wabbling, staggering, unsteady equilibrium. Sometimes the sick animal stands with depressed head and arched back.

7. The kidneys are usually quite active. Large quantities of urine are passed. In mild cases the urine is darker than usual and in severe cases the urine may be blood red (port wine color). This excess of color is the coloring matter from the broken-down red cells of the blood, and it is excreted from the body largely by the kidneys. The red colored urine does not contain blood, yet it leads many to call the disease "bloody murrain" or "red water." Remember that all acute cases or fatal cases do not pass red urine, but out of a number of sick animals in a herd some of the severe cases will pass red urine.

8. In some cases the eyelids become swollen so much that the animal can hardly open the lids sufficiently wide to see. Many cases are accompanied by a more or less prominent swelling under throat or root of the tongue, between the branches of the lower jaw.

As a rule the sick animal becomes separated from the rest of the herd; if weather is warm it seeks the shade, stands with arched back and shrunken abdomen, or lies down from weakness. In cool weather, or during the winter season, many cases perish largely from exposure to cold nights and cold rains.

EXAMINATION AFTER DEATH may help one in making an accurate decision in regard to the disease causing the death of the animal. Post mortem conditions are sometimes quite characteristic and constant; yet in some instances some of the common characteristics may be absent or not sufficiently marked as to be recognized. The condition of the carcass as to flesh will vary with the length of time the animal was sick, and the type or severity of the disease. As a rule a few days of high fever that suspends all digestive action will lead to rapid emaciation. In cutting through the skin notice that there is very little blood in it or the tissue just under the skin, and the small amount of blood in the skin is pale, and does not readily coagulate. After opening the abdominal cavity, examine the liver, the spleen, the kidneys, the bladder, the stomachs, and the intestines. If the animal died in one to three days after becoming sick the liver may be very large—engorged with blood and bile, giving it a rather dark brown color; but if the animal lived a number of days after becoming sick the liver will be engorged with bile and will have a deep yellowish tinge; this yellow color is very prominent upon a cut surface of the liver. The gall bladder is usually excessively distended with thick flaky bile. The bile is said to be thicker and more flaky in cases that were sick several days before dying than it is in cases that die in a short time after becoming affected.

The spleen or "melt" is generally much larger than it is in the healthy animal; it may be three or four times as large as a normal, healthy one. It is darker than a normal one, and when cut open its bluish-black contents slowly flow out. There are some genuine cases of Texas fever in which the spleen is not very much enlarged or changed in color and structure.

The mucous membrane lining the fourth stomach and intestines may be inflamed or eroded in spots or patches; cut them open and wash away the contents so that the red, inflamed or ulcerated condition may be distinctly observed. In some cases the contents of the fourth stomach and of the intestines in places may be tinged with blood; if the intestinal contents are hard and firm they may be surrounded by a gelatinous material or exudate that is in places tinged with blood.

In severe cases when the animal dies early in the course of the disease, the kidneys may be enlarged and they may have a uniform brownish red color throughout their entire structure. Cover glass smears made with blood taken from the kidneys will show that a very large per cent. of the red blood cells contain the microparasite. The bladder will usually contain more or less dark brown or red colored urine. The color is produced by the hæmoglobin that is held in solution in the urine and comes from the disintegrated red cells of the blood. The urine also contains albumen.

The white membranes or tissues of the body—such as the serous and mucous membranes, the connective tissue under the skin, etc.—may become tinged with yellow very like the jaundice yellow in man. This is most prominent or marked in chronic cases or cases of long duration.

The heart, according to Smith, has the right ventricle "distended with blood, fluid or clotted, according to the time elapsing between death and the examination. The left ventricle is usually firmly contracted and may contain a small quantity of fluid or clotted blood." The small extravasations of blood under the epicardium and endocardium are quite constant; they are most numerous on the outside and inside of the left ventricle.

WHAT IS IMMUNITY TO TEXAS FEVER?

IMMUNITY means that an animal is not susceptible to Texas fever. It is now believed that an animal can acquire immunity only by having the disease—one or more attacks. One severe attack of the fever or two or more mild attacks usually insure a safe immunity.

Immunity will last as long as the life of the animal, if said animal becomes infested with ticks one or more times each year of its life. But my observation of the disease, as it occurs in native Alabama-bred cattle, leads me to believe that immunity can be lost in two or three years by keeping the animal free of all ticks. I am confident that loss of immunity in this way explains the occasional outbreak of Texas fever in herds that have been kept free of ticks for two or more years, and then letting the cattle become infested with ticks.

METHODS OF PRODUCING IMMUNITY TO TEXAS FEVER.

The natural method is the one in which the ticks do the inoculating. Four different forms of tick inoculations have been tried. In many instances Northern-bred cattle were brought into the South, turned out with the herd; permitted or forced to "rough it," and survive or perish with slight or excessive tick inoculation and poor care. Fifty to ninety per cent. of Northern-bred and imported cattle so treated died—a mortality too great to be profitable. A modified form of this careless way has been employed by many with much more favorable results. The susceptible animals are kept by themselves in barns, pastures and lots separated from native Southern cattle; at the same time a few ticks are allowed to get on the cattle, but excessive tick infestation is prevented. In a majority of such animals tick-inoculation occurs gradually. One summer in the South under such conditions has usually produced immunity. However, losses by this means are too great to recommend it when better means can be obtained.

Dr. Connoway of the Missouri Experiment Station, and Dr. Francis of the Texas Experiment Station, have tried to control tick inoculation by placing a definite number of young seed ticks upon the suscpetible animals at different times. Collect full grown female ticks from Southern cattle and put them in a fruit jar or some vessel having a little moist earth at the bottom; this jar is then placed in an incubator or in the kitchen near a warm chimney or stove; in 15 to 20 days the female ticks will have deposited their eggs and the eggs will have hatched into a mass of lively seed ticks. About 25 of these seed ticks are placed upon each susceptible animal (best time in late fall or in winter) and they will inoculate each animal so that in the course of 10 to 30 days the fever will appear. When the animals recover from the mild attack of the fever (say in 40 to 50 days) a larger number (about 100) of incubator seed ticks are put upon each animal; this should produce a second attack of fever. When the cattle recover from it they are immune and ready for the pasture. At no time in this treatment should the cattle want for good feed and protection from cold nights and rains. Some losses occur by this method, and it is a little more inconvenient and uncertain than either of the two methods that will be mentioned following this.

The fourth modified form of tick inoculation is the **one where sucking calves, 2 to 4 months old, are brought into the South in the fall or winter or early spring,** and allowed to take milk from a Southern-bred cow or are fed fresh sweet milk from a Southern cow. While young and during the time before it is weaned, put a few seed ticks upon the calf or permit them to get upon it in small numbers. Natural tick inoculation will then occur when the calf is best able to resist severe fever and to recover from it. It is possible that the milk of a Southern-bred immune cow may have some immunizing power, but I doubt it. I think the milk of a non-immune cow would be as effective because it keeps the calf in the best of condition to resist, and to recover from, the fever or attack of the micro-parasites upon the red blood cells. It is a well-known fact that young calves or cattle do not have Texas fever in as severe a form as do older or mature cattle. All competent observers or investigators of Texas fever have noted that fact. According to Hunt of Australia, (who produced by inoculation the fever in calves born of immune cows), immunity is not inherited. It is very probable that all Southern-bred calves do not inherit immunity, but acquire it after birth by tick inoculation. No doubt that the vast majority of Southern-bred calves have the fever in such a mild form that it is not appreciable. This partial immunity of calves to the fever may be explained by the fact that young animals have a greater number of red blood cells per cubic millimeter than do older animals, and can carry on the functions of the blood better in case of loss of red blood cells. Also, the power of reproducing red blood cells is greater in the young than in the older animals. This may be due to the fact that there is a relatively greater quantity of red marrow in the young animals, and this red marrow tends to reproduce red blood cells nearly as fast as they are destroyed by the micro-parasite. The general vigor of a young animal may add to its resisting and recuperating power. Moreover, it is well-known that young animals exhibit greater power of repairing wounds and recovering from almost any disease than older ones. Broken bones unite quicker and better in young animals than in mature ones. As Dr. Francis remarks, this method of immunizing sucking calves is a good and safe way for farmers who buy a few animals; but where many animals are wanted for a large ranch it is cheapest to use the defibrinated blood method. One drawback to immunizing calves is that the owner must wait one or two years before the calves develop into breeding animals; it means loss of time, but is a safe method.

The Defebrinated Blood Method of producing immunity to Texas fever in cattle was originated or discovered in Australia. It has been most extensively employed i nthis country by Dr. Connoway of the Missouri Experiment Station, and Dr. Francis of the Texas Experiment Station. It has been tested by the Bureau of Animal Industry at Washington, D. C., and by the Louisiana, the Mississippi and the Alabama Experiment Stations.

Brefly speaking, it consists in inoculating a susceptible or non-immune animal with blood that is freshly drawn from an immune animal and defebrinated. The animal from which the blood is derived should be at least two years old, and Southern-bred, and known to have had ticks upon it some time during the second summer of its life. A Northern-bred animal, that has acquired immunity by having had an attack of Texas fever within one year, may also be used as a source of blood for inoculation. After securing the animal the following instruments and articles should be prepared for the inoculation:

A sterilized hypodermic syringe, one or two sterilized scalpels or sharp knives, one or two sterilized aspirating needles with an inside diameter of 1 to 2 millimeters; a clean sterilized beaker or wide-mouth bottle, containing a small glass rod, and the bottle or beaker should be plugged with aseptic absorbent cotton; one pair of scissors, a 2 per cent. solution of creolin, and sterilized cotton or sponge, and sterilized distilled water. The water may be sterilized by boiling one hour.

Any or all of the above named articles, except the creolin solution and water, may be sterilized by placing them in a vessel of cold water, and then heating the water until it boils for one hour.

The animal from which the blood is to be drawn may be secured by using a cattle nose-leader or by casting it with ropes, hobbles, etc. Clip the hair very close over a space 3 to 6 inches long and 2 inches wide along the jugular forrow on either side of the neck (just over the jugular vein). Wash the clipped skin with soap and water; then with the creolin solution and then with distilled water. Now cord the neck of the animal as the neck of a horse is corded just before it is to be bled. When the neck is corded the jugular vein stands out prominently. Now the aspirating needle, with its point inclined toward the head, is pushed into the jugular vein and the blood that escapes through the hollow needle is caught in the sterilized breaker or wide-mouth bottle, and stirred slowly with the glass rod, being careful to hold the cotton plug over the mouth of the breaker or bottle while stirring. As the fibrin collects in clots on the glass rod, it may be lifted out, and by a quick jerk of the rod the clot is dislodged from the rod and the rod is then returned to the breaker or bottle, and the blood is stirred until no more fibrin collects on the glass rod. In the breaker or bottle will remain nearly all of the red blood cells floating in the blood serum and some of these red blood cells will contain the micro-parasites that cause Texas fever. This deferinated blood should be kept warm (above 90 degrees Fah.) and when the susceptible animals are ready for inoculation, the defebrinated blood may be drawn into the warm hypodermic syringe and 1 cc injected under the skin of each susceptible animal. Remember that it is essential that the defibrinated blood should be kept warm and that the inoculations should be made as soon as possible after the defirinated blood is prepared, because it may become cool, or contaminated with septic or pus germs. It is best to have the cattle that are to be inoculated confined by halter or chains or stanchions in stalls. I should not advise the use of defibrinated blood that is over an hour old.

In about six to ten days after the inoculation the temperature of the inoculated animals will rise, ranging between 103 and 106 degrees Fah. The fever may continue from 3 to 15 or more days; then fall to normal (102); a secondary fever usually begins about the thirtieth day after the inoculation and may continue for several days. According to Pound, Francis and Connoway the primary inoculation fever appears in 6 to 10 days, and the secondary inoculation fever appears about the thirtieth day after the inoculation. The primary inoculation fever, as a rule, is more regular or will occur with greater regularity than the secondary inoculation fever. In many cases the primary inoculation fever will be constant and regular, thereafter the temperature may rise and fall irregularly. In rare instances there may be a low continuous fever covering 20 to 40 days. Again there may occur but one fever period and that occur 20 to 30 days after the inoculation. As a rule, it requires from 40 to 50 days to pass through the inoculation fever periods. After recovery from the first inoculation, a second one is given to each animal. In case the first inoculation does not produce a fever running up to 105, it is always best to give a second inoculation and increase the dose of defibrinated blood; if 1 cc was employed in the first inoculation, use 2 cc of defibrinated blood in the second inoculation. As a rule, the second inoculation produces fever periods as in the first inoculation, but the fever is milder than it was following the first inoculation.

Inoculations to produce immunity to Texas fever should be made in the South sometime between Nov. 1st and the following March 1st, and never during hot weather. During the early spring or during the winter, immediately after the cattle have recovered from the inoculation fever, permit a few ticks to get on them. And when the hot weather of June, July, August and September comes, keep off the excess of ticks by applying once per week over places where ticks are most frequently found on the animals, crude Beaumont oil, or a 20 per cent. kerosene oil emulsion.

Immune animals are injured to some extent by supporting an excessive number of ticks.

In looking for accurate results from a large number of inoculations I wrote Dr. Francis of the Texas Experiment Station, and he kindly gave me the valuable facts which you may see in his letter published below.

Notice that out of 1,500 animals inoculated by him 3½ per cent. were lost by inoculation fever and less than 7 per cent. by exposure to tick inoculation after recovery from defibrinated blood inoculation. Remember that the vast majority of the cattle inoculated by him were placed in large pastures on ranches where little or no attempt was made to keep off ticks; and that in many previous instances Northern-bred cattle under like conditions had a mortality as high as 50 to 90 per cent.

College Station, August 5, 1901.

Dr. C. A. Cary, Auburn, Ala.

Dear Doctor—I have your letter of the 2nd in regard to our experiments with Texas fever. I am preparing a bulletin on the subject now and hope to have it off within six weeks. I have inoculated about 1,500 calves. These run all the way from a few months old to two years of age. I cannot tell you without several hours' work just how many of each age. I may say, however, that the best age is about one year old. The best time of the year is any time from November to March.

We consider one cubic centimeter as a standard dose. We use all the way from one-half of one cc to two cc, but one cc is a standard dose. We take the blood direct from the jugular vein of any Texas-raised animal that is in good health. We usually take something that is two or three years old, so as to avoid the transmission of tuberculosis.

As a general rule, we make two inoculations. I think, however, that one is enough, but we use two merely to be sure of an infection. If the time between inoculation and exposure to ticks is several months, I favor two inoculations.

I think that all our calves born in Texas are susceptible to fever, but pass through it while they are still young. I have seen some of our calves with the acute fever and passing red urine that were born and raised here. If they be raised in a pen, say in town, the death rate is pretty high among them, but those that are raised out in pastures the death rate is very low, and the attacks escapes ordinary observation.

The mortality from inoculation fever is about 3½ per cent. Dr. Conoway has written me the exact number that he has done, and the mortality. It is essentially the same as ours, but I hardly feel at liberty to give you his data. He will certainly supply you with it if you write him. I am yours very truly,

M. FRANCIS.

P. S.—To make a general statement will say that we now save about 90 per cent. of all Northern cattle brought into this country. M. F.

TABLE I—Temperature Records of Registered Northern-Bred Cattle, Inoculated with Defibrinated Blood.

DATE.	Admiral.		Baroness		Champion.		Gazelle.		Clemantina.		Charley.	
1899.—1900.	A. M.	P. M.	A. M.	P. M.	A. M.	P. M.	A. M.	P. M.	A. M.	P. M.	A. M.	P. M.
Dec. 26	....	100.6	....	102.6	....	103.0	....	102.6	....	101.6	....	102.6
Dec. 27	102.0	101.4	102.2	100.8	100.0	102.2	100.4	102.0	102.0	101.6	100.4	100.4
Dec. 28	104.4	101.8	100.4	101.6	100.8	102.0	100.2	101.6	100.0	101.6	100.6	102.4
Dec. 39	101.6	102.2	101.2	102.2	101.4	102.8	101.6	102.6	101.4	101.2	100.8	102.8
Dec. 30	101.8	101.4	101.4	102.6	101.8	102.2	101.8	102.2	101.4	101.8	101.6	102.2
Dec. 31	101.8	101.8	101.8	101.2	101.2	102.2	101.8	101.8	101.4	101.4	102.0	102.2
Jan. 1	101.8	102.0	101.8	102.8	102.2	102.4	101.8	102.2	101.4	101.4	103.2	101.6
Jan. 2	102.0	101.6	101.8	103.0	101.8	102.6	101.2	102.6	101.0	102.0	102.2	102.4
Jan. 3	102.4	102.0	102.4	102.6	102.8	102.6	101.4	102.4	101.0	101.6	102.4	102.2
Jan. 4	101.4	102.0	103.4	103.0	101.4	102.8	101.6	102.4	101.4	101.4	100.8	102.4
Jan. 5	102.2	102.0	104.2	103.6	102.2	103.6	101.4	102.4	100.4	101.4	102.0	102.2
Jan. 6	101.4	101.4	104.8	104.6	102.0	102.4	101.6	103.0	101.2	102.0	101.8	102.0
Jan. 7	101.4	102.0	104.2	104.2	102.0	103.8	103.8	104.6	100.8	101.0	101.8	102.0
Jan. 8	102.0	101.8	103.0	104.8	102.6	102.2	103.2	103.4	101.4	101.8	101.8	102.0
Jan. 9	101.6	102.8	103.6	104.8	102.6	103.0	101.4	103.2	101.2	101.6	102.0	102.2
Jan. 10	101.8	101.6	103.8	105.0	102.5	103.2	104.0	104.2	101.2	102.4	101.8	102.5
Jan. 11	102.2	102.4	104.8	104.0	104.2	104.0	104.4	104.2	102.0	102.2	102.2	102.8
Jan. 12	101.3	101.6	102.4	103.2	101.8	101.8	103.4	104.8	101.8	102.2	101.0	101.4
Jan. 13	101.6	101.8	103.0	104.0	101.6	102.6	104.0	105.4	102.0	101.8	102.0	102.0
Jan. 14	101.6	101.8	103.2	104.6	102.0	102.1	104.6	104.3	101.2	102.0	100.8	101.6
Jan. 15	101.4	101.8	103.6	104.4	102.0	103.4	103.4	103.0	101.6	101.8	101.8	102.3
Jan. 16	101.6	102.8	104.1	105.2	102.0	103.4	102.2	102.6	101.4	101.8	101.4	101.8
Jan. 17	101.4	101.2	103.6	104.8	102.8	103.2	102.4	102.4	102.0	101.6	101.2	102.6
Jan. 18	102.8	103.4	104.6	105.4	102.3	103.0	102.8	103.2	101.0	101.4	102.2	102.2
Jan. 19	102.0	102.0	103.6	103.6	103.0	103.8	102.2	103.6	101.0	101.6	101.5	103.0
Jan. 20	102.0	102.4	103.8	105.0	101.8	101.4	103.0	104.4	101.4	101.6	102.2	101.8
Jan. 21	101.2	102.0	103.0	104.2	102.2	103.2	104.0	104.2	100.2	101.0	101.6	102.2
Jan. 22	101.6	103.1	105.2	105.4	102.2	102.9	103.6	104.2	101.2	101.4	102.2	103.2
Jan. 23	102.0	102.0	102.2	103.4	101.8	103.2	103.4	103.8	101.0	102.4	103.0	103.8

Jan. 24	101.6	103.2	102.6	104.0	102.0	102.4	102.8	103.2	101.0	102.2	102.6	103.4
Jan. 25	103.4	103.2	102.8	103.4	102.8	104.2	102.6	102.2	101.0	102.6	102.8	103.0
Jan. 26	102.2	103.2	102.6	103.0	103.0	104.2	102.0	102.2	101.4	102.0	103.6	103.6
Jan. 27	104.0	104.4	102.2	102.8	103.0	106.0	101.8	101.4	102.0	101.8	103.0	103.8
Jan. 28	102.0	104.0	102.2	103.2	104.4	106.0	101.4	101.6	101.6	102.0	103.0	103.0
Jan. 29	103.4	104.8	103.2	103.4	103.6	106.0	101.6	102.2	102.2	102.2	102.2	102.8
Jan. 30	103.0	103.6	103.6	103.6	104.2	105.2	101.4	102.6	101.6	102.8	102.6	103.2
Jan. 31	103.0	103.4	102.8	102.4	105.0	105.6	102.4	102.6	101.2	102.8	102.6	103.0
Feb. 1	104.0	104.6	103.0	103.6	105.6	105.6	103.4	103.0	102.8	104.2	102.0	102.0
Feb. 2	102.6	103.6	102.8	103.6	105.2	105.8	103.0	103.4	102.6	105.0	102.0	102.0
Feb. 3	102.8	103.8	103.0	103.0	103.4	105.8	102.0	101.4	102.0	105.6	101.6	101.8
Feb. 4	102.6	102.6	102.8	103.0	105.0	105.2	101.8	102.2	101.6	104.4	101.4	102.2
Feb. 5	101.2	102.0	103.2	103.4	104.6	104.6	102.0	102.0	102.6	105.0	101.2	101.0
Feb. 6	102.8	102.0	102.6	103.0	105.6	105.8	101.6	102.0	101.4	103.0	102.2	102.0
Feb. 7	102.2	102.0	103.0	102.2	104.4	103.0	102.4	103.0	102.6	103.4	102.4	101.6
Feb. 8	102.0	102.0	103.0	102.6	102.4	102.0	102.2	102.6	102.4	103.2	102.0	101.8
Feb. 9	101.2	101.0	102.6	102.6	101.0	102.2	102.0	102.4	102.0	102.0	100.6	101.4
Feb. 10	101.4	101.8	103.0	102.6	102.4	101.8	102.4	102.6	102.0	102.2	102.0	101.6
Feb. 11	102.0	101.4	103.2	102.8	102.0	102.8	102.4	102.4	102.2	102.0	102.0	101.8
Feb. 12	102.0	101.6	103.4	103.4	104.0	101.8	102.0	102.2	101.6	102.4	102.4	101.4
Feb. 13	102.0	101.8	102.6	102.4	102.4	103.0	101.8	102.4	101.6	102.0	101.4	101.6
Feb. 14	101.0	102.0	102.0	102.0	101.8	103.4	102.6	102.0	101.4	101.6	102.2	102.6
Feb. 15	101.6	101.6	102.4	102.4	102.0	103.0	101.8	102.4	102.0	102.0	102.2	101.8
Feb. 16	101.2	102.0	102.4	102.8	101.8	102.4	102.0	102.4	101.2	102.0	101.8	102.8
Feb. 17	101.8	101.4	103.0	103.2	101.8	101.4	101.8	102.4	101.6	102.0	102.6	101.6
Feb. 18	100.8	101.4	103.4	103.6	101.4	102.4	102.4	102.6	101.8	102.4	102.0	102.4
Feb. 19	101.2	101.6	103.4	103.6	101.4	103.0	102.6	102.6	100.4	101.4	101.4	101.8
Feb. 20	101.8	101.4	102.8	103.4	102.4	102.4	101.4	101.4	100.8	102.0	102.0	102.0
Feb. 21	102.0	101.6	102.2	102.4	102.2	102.6	102.2	102.0	102.0	102.0	102.2	101.8
Feb. 22	101.2	101.6	102.2	102.2	101.8	101.8	101.4	100.6	100.8	101.4	101.2	102.2
Feb. 23	101.2	101.6	101.8	102.6	102.2	103.0	101.4	101.8	101.0	101.4	101.0	102.0
Feb. 24	101.4	101.8	101.8	103.0	102.0	101.8	102.0	102.2	101.4	101.8	101.8	102.0
Feb. 25	101.4	101.6	101.6	102.6	102,0	102.6	101.8	101.4	102.0	101.2	101.2	102.4

TABLE I.—Continued.

DATE.	Admiral		Baroness.		Champion.		Gazelle		Clementina		Charley	
1899.—1900	A. M.	P. M.	A. M.	P. M.	A. M.	P. M.	A. M.	P. M.	A. M.	P. M.	A. M.	P. M.
Feb. 26	100.8	104.0	102.0	102.0	102.0	102.4	100.4	102.4	100.8	101.6	101.6	101.6
Feb. 27	101.4	103.4	102.0	105.2	101.4	102.8	101.8	101.6	102.0	102.4	101.8	101.6
Feb. 28	101.0	101.4	102.0	102.0	102.2	102.6	101.2	101.2	101.0	101.0	101.4	101.0
March 1	101.4	102.6	102.2	102.8	101.6	102.2	101.4	101.0	101.2	102.4	101.8	101.6
March 2	101.0	102.0	104.4	103.8	102.8	103.2	101.2	101.4	100.8	101.0	101.4	102.0
March 3	102.0	103.6	103.6	105.4	101.2	104.6	101.2	102.0	101.8	101.4	101.6	102.4
March 4	102.0	102.0	101.0	102.0	101.2	102.4	102.0	102.0	102.0	101.8	101.0	102.0
March 5	101.0	102.0	102.0	102.2	102.4	102.2	101.6	102.0	100.8	101.4	102.0	102.0
March 6	101.0	101.2	101.6	102.0	103.0	102.6	101.4	102.2	101.2	102.0	101.6	102.0
March 7	101.4	101.4	101.8	102.0	102.0	102.0	101.4	101.6	101.4	101.6	101.6	101.0
March 8	101.4	101.0	102.4	101.6	102.4	101.8	101.8	101.2	101.6	101.4	101.4	101.0
March 9	102.0	102.4	102.4	103.6	101.6	103.4	102.0	102.0	102.0	101.6	101.6	102.2
March 10	101.0	102.0	102.8	102.8	102.0	102.8	101.2	102.0	101.0	101.8	102.0	101.4
March 11	101.0	102.0	102.2	102.6	101.6	105.0	101.6	102.8	101.4	102.0	101.8	103.8
March 12	101.0	102.6	102.0	103.2	102.0	104.4	102.2	101.8	101.4	101.6	101.8	103.0
March 13	101.0	102.0	104.0	104.4	101.8	103.6	101.8	102.0	101.6	102.0	101.4	102.4
March 14	101.2	101.8	102.4	103.0	103.0	103.4	102.2	101.6	101.4	101.2	101.6	102.4
March 15	101.4	101.0	102.0	102.0	103.0	102.4	101.2	101.4	101.4	101.4	102.4	101.4
March 16	101.0	101.8	102.4	102.4	102.2	103.0	101.4	102.0	101.4	102.0	101.2	102.0
March 17	102.0	102.0	101.8	102.4	102.2	102.2	100.8	101.8	101.4	102.0	100.8	101.8
March 18	100.4	101.8	101.4	102.6	101.6	102.0	101.0	102.0	100.8	101.4	100.6	101.8
March 19	101.0	101.6	102.2	102.2	101.0	102.8	101.2	102.0	101.2	101.2	100.6	101.8
March 20	101.2	102.2	102.8	104.0	101.6	102.2	101.2	102.4	101.6	101.6	101.0	102.0
March 21	101.0	102.0	102.8	102.0	101.8	101.6	102.0	102.0	101.2	101.6	102.0	102.0
March 22	103.0	101.6	102.4	103.0	101.4	102.2	101.2	102.0	101.2	102.2	102.0	102.0
March 23	101.0	101.0	102.4	103.0	101.0	102.2	101.0	101.2	101.4	101.8	101.4	100.6
March 24	101.0	101.6	102.6	102.6	101.0	102.0	101.8	102.0	102.0	102.4	101.0	102.0
March 25	101.2	101.2	102.8	102.2	102.6	102.0	102.0	101.4	101.6	101.6	102.0	102.4
March 26	**101.4**	**101.8**	**102.0**	**102.2**	**102.0**	**102.6**	**101.6**	**102.2**	**101.6**	**102.0**	**102.0**	**101.6**

March 27	100.6	101.5	101.8	103.2	102.0	102.2	101.6	102.0	101.4	103.0	101.8	102.5
March 28	100.8	101.4	101.4	102.6	102.2	102.4	102.0	102.2	101.8	102.0	101.8	102.0
March 29	101.0	101.6	101.6	102.4	102.0	102.4	101.4	102.4	101.2	102.6	101.8	101.8
March 30	101.4	101.8	101.2	102.4	101.6	102.8	101.4	102.2	102.0	102.6	102.0	102.2
March 31	101.6	101.6	101.0	102.8	102.0	102.8	101.8	102.0	101.2	103.0	101.8	102.4
April 1	......	......	......	......	......	......	......	......	103.2	103.2	......	......
April 2	......	......	......	......	......	......	......	......	102.2	102.8	......	......
April 3	......	......	......	......	......	......	......	......	......	102.2	......	......
April 4	......	......	......	......	......	......	......	......	......	......	......	......
April 5	......	......	......	......	......	......	......	......	......	......	......	......

TABLE II

Temperature Records of Registered Bulls which had **Texas Fever** as a result of Tick Inoculation the first Summer following **Defibrinated** blood Inoculation.

DATE.	Admiral.		Charley		Champion.	
1900.	A. M	P. M	A. M	P. M.		
August 10	....	107.0	....	107.0	....	....
August 11	105.8	106.2	106.2	106.0	....	....
August 12	106.4	106.4	105.4	104.8	....	....
August 13	106.0	104.8	103.0	101.8	....	....
August 14	105.0	106.6	101.0	102.8	....	....
August 15	101.8	100.8	101.0	102.0	....	....
August 16	100.0	101.0	101.2	103.0	....	....
August 18	....	105.4	....	105.8	....	....
August 19	107.0	107.4	105.0	105.4	....	....
August 20	106.0	105.6	104.8	106.3	....	**107.4**
August 21	105.0	105.4	....	104.8	....	....
August 22	103.6	105.0	105.0	102.8	106.0	105.0
August 23	103.0	105.0	101.8	102.4	102.4	102.4
August 24	100.6	104.8	102.0	103.4	101.0	102.4
August 25	104.0	104.8	102.0	102.4	103.0	104.0
August 26	104.0	104.9	101.8	104.0	102.0	104.6
August 27	104.0	104.2	101.8	102.4	101.2	101.8
August 28	103.0	105.0	101.8	104.4	102.0	100.4
August 29	103.0	105.0	101.8	105.0	106.0	105.0
August 30	103.0	104.2	102.4	104.4	102.8	105.4
August 31	103.0	104.2	....	103.6	....	105.2
September 1	103.4	104.2	....	102.0	....	102.2
September 2	103.2	103.8	....	....	....	....
September 3	103.0	103.9	....	....	....	....
September 4	103.0	104.4	....	....	....	....
September 5	103.6	104.4	....	....	....	....
September 6	103.0	104.2	....	....	....	....
September 7	103.0	104.2	....	....	....	....
September 8	104.0	103.8	....	....	....	....
September 9	103.0	104.8	....	....	....	....
September 10	103.0	104.3	....	....	....	....
September 11	103.0	104.6	....	....	....	....
September 12	103.4	104.8	....	....	....	....
September 13	102.8	103.0	....	....	....	....
September 14	103.0	103.8	....	....	....	....
September 15	102.8	104.6	....	....	....	....
September 16	102.8	104.8	....	....	....	....
September 17	102.6	103.8	....	....	....	....
September 18	102.0	102.8	....	....	....	....
September 19	101.6	104.8	....	....	....	....
September 20	101.6	104.4	....	....	....	....
September 21	101.4	104.4	....	....	....	....
September 22	102.4	104.2	....	....	....	....
September 23	101.8	104.6	....	....	....	....
September 24	101.6	104.8	....	....	....	....
September 25	102.8	105.0	....	....	....	....
September 26	102.2	103.8	....	....	....	....
September 27	102.2	105.0	....	....	....	....

TABLE II—Continued.

DATE.	Admiral.		Charley.		Champion	
1900	A. M.	P. M.	A. M.	P. M.	A. M.	P. M.
September 28	103.0	105.6	....	....	....	....
September 29	102.2	105.6	....	....	....	....
September 30	101.0	104.6	....	....	....	....
October 1	101.8	103.8	....	....	....	....
October 4	104.0	104.6	....	....	....	....
October 6	103.2	104.4	....	....	....	....
October 7	103.2	104.6	....	....	....	....
October 8	....	103.6	....	....	....	....
October 9	....	102.8	....	....	....	....
October 10	....	103.6	....	....	....	....
October 11	....	102.8	....	....	....	....
October 12	....	102.8	....	....	....	....
October 14	....	102.8	....	....	....	....
October 19	....	103.2	....	....	....	....
October 20	....	104.0	....	....	....	....
October 21	....	102.8	....	....	....	....

CLINICAL RECORDS OF THE ANIMALS INOCULATED WITH DEFIBRINATED BLOOD.

All of the cattle that were inoculated at Auburn were stabled at night, carefully handled during the entire period of inoculation. The ticks were kept off by weekly applications of kerosene oil emulsion. Neither cotton seed nor any of its products were fed them during the inoculation periods. Unless otherwise mentioned, the blood used in the inoculations was derived from a two-year-old Southern-bred Jersey heifer, which had been infested with ticks during its second summer, and had been tested for tuberculosis.

1. Admiral (see Table I), a red poll bull, bred in Illinois, arrived in Alabama Nov. 11, 1899, at the age of ten months, weighing 742 lbs. December 26, 1899, was inoculated with 1 cc of defibrinated blood. Very little, if any, primary inoculation fever occurred; but a fairly good secondary inoculation fever began January 25, 1900 (30 days after the inoculation), and continued until February 4. He was inoculated a second time February 21, 1900, with 1½ cc of defibrinated blood. A very slight rise of temperature appeared on February 26 and 27, March 3 and 4, and March 22. The inoculation fever periods in this animal were all more or less irregular, very slight or absent, excepting the secondary inoculation fever following the first inoculation. During the entire inoculation periods he exhibited no signs of ill health. Ticks first appeared upon him June 16. July 21 he was very much depressed or dumpish. August 10 he began to breathe rapid and shallow; morning temperature 107, and at noon 108 degrees Fah., remaining at about 106 for the next four days; then it dropped to normal for two days, rising to 107.4 on August 19. His

temperature ranged between 103 and 105 until September 15, remaining above normal nearly all of the time from August 19 to October 1. Thereafter there were occasional or irregular rises in his temperature (see his temperature record in Table II). When the high fever began his urine became highly colored (port wine color), and was excreted in large quantities; this condition continued for more than a week. The urine contained a large quantity of albumen.

August 11, about the beginning of the fever, his bowels became inactive; he was first given Epsom salts, and then raw linseed oil with rectal injections of warm water,—the last being given three times per day. But the moderate doses of purgatives and large enemas failed to produce a normal action of the bowels for 14 days. His bowels began to act August 26, and the feces were very soft, dark in color and many times were covered with gelatinous mucus. His appetite was almost entirely lost; he nibbled at bran, sorghum, hay and grass; but did not ruminate until he began to recover. Digestion was almost entirely suspended. During the suspension of digestion, fermentation and bloating were controlled by giving internally dram doses of creolin and by using the trocar and canula (tapping the rumen or pounch to let out the gas). His weakness caused him to lie down much of the time. About August 26 he began to improve, his appetite became a little better; rumination and digestion were resumed, and his bowels began to act freely; yet recovery was slow and in fact he has not yet completely recovered. Periods of improvement and periods of depression have appeared irregularly for twelve months. August 8, 1899, two days before the fever began, he weighed 1027 lbs., and September 24, 805 lbs.; March 30, 1901, 775 lbs.; October 5. 1901, 905 lbs. His appetite, digestion and assimilation have been deficient; have been below normal, and consequently very little improvement has been made.

August 13, 1900, there were 4,175,000 red cells in 1 ccm. of his blood.

August 20, 1900, there were 4,550,000 red cells in 1 ccm. of his blood.

August 23, 1900, there were 4,400,000 red cells in 1 ccm. of his blood.

August 17, 1901, there were 6,400,000 red cells in 1 ccm. of his blood.

September 26, 1901, there were 7,090,000 red cells in 1 ccm. of his blood.

The treatment of Admiral during the fever was directed toward keeping the bowels active by using rectal injections of warm water, and by giving, per mouth, small doses of raw linseed oil,—creolin and tapping being used to control bloating. Quinine in 30 to 120 grains doses were given every six hours to destroy the micro-parasite which causes the disease. To keep up heart action and tide over periods of great depression and weakness, tincture of digitalis was given in 2 to 4 fluid. dram doses; also tinct. of nux vomica was used to stimulate the heart. Gention was given as a stomachic to improve the appetite and digestion after the acute stage had passed; also tincture chloride of iron and Fowler's solution of arsenic were tried, with the idea that they would increase the hæmoglobin and number of red blood corpuscles. But no appreciable results followed the use of the last two named drugs.

Clemintina (see Table I), a registered red poll heifer, bred in Illinois, was 1 year old when shipped to Auburn, Ala., arriving November 8, 1899, and then weighed 770 lbs. December 26 she was inoculated with 1 cc of defibrinated blood. She had no primary inoculation fever, and a very slight secondary fever appeared February 1 to 8, about 36 days after inoculation. February 21 she received a secondary inoculation of 1½ cc of defibrinated blood. A very slight elevation of temperature occurred about 40 days after the second inoculation. Of all the six full blood cattle inoculated at the same time she reacted the least. During the shipment she accidentally got with calf and aborted July 26. Preceding and following the abortion she had some fever and it is very probable that the abortion was caused by the fever. According to the Australian authorities Texas fever produced by defibrinated blood inoculation is often attended by abortion in pregnant cows. This heifer has kept in the best condition, and has made an almost continuous growth from the time of her arrival in Alabama to the end of her second summer. November, following her first summer she weighed 1020 lbs. at 2 years old, and on August 10, 1901, she weighed 1190 lbs. She dropped a bull calf about September 20, 1901.

Champion of Alabama, (see Tables I and II), a short-horn bull, bred in Missouri, arrived at Auburn, Ala., November 8, 1899, at the age of 7 months, weighing 472 lbs. In shipping he caught cold and had an attack of bronchitis the first week after his arrival in Alabama. December 26 he was inoculated with 1 cc of defibrinated blood. If primary fever appeared it lasted only one day, on January 11. A well marked secondary inoculation fever occurred from January 28 to February 7, beginning 31 days after the inoculation, and continuing 12 days. February 21, 1900, he received a second inoculation of 1½ cc of defibrinated blood. The fever periods following the second inoculation were indistinct and irregular. During the secondary fever period of the first inoculation he became very sluggish, lost his appetite and decreased about 20 lbs. in weight. This calf was weak and unthrifty when inoculated, and had days of dumpishness and loss of appetite during the entire winter. While the reaction to the inoculation was well marked for only one period, yet he seemed to be affected more by the fever than any of the other five animals that were inoculated at the same time. During the summer of 1900 and of 1901 he became infested with ticks at different times, and for a short time in August had a period of high fever, going as high as 107 one evening (see Table II). Thereafter he made rapid gains, and on August 10, 1901, he weighed 1200 lbs. His growth during the second summer has been very good.

Sixth Gazelle of Maple Hill (See Table I), a shorthorn heifer, bred in Missouri, arrived in Alabama November 8, 1899, at the age of 11 months, weighing 692 lbs. Was first inoculated December 26 with 1 cc of defibrinated blood. The primary inoculation fever began January 7, (12 days after inoculation), and continued until January 26 (19 days). The secondary inoculation fever appeared about January 31; it was very mild and not distinctly marked. On February 21, this heifer received a second inoculation of 1½ cc of defibrinated blood, but no distinct fever reaction followed this inoculation. She lost her appetite one or two days, and had one day of short and rapid respirations during the primary fever of the first inoculation. February 16 and 22 a very few ticks were found on her. June 16 several ticks were found on her, having been in tick-infested pasture since April. July 16 she appeared dull and stupid, and July 24 her temperature rose a little above the normal; no doubt she had, at this time, a very mild attack of fever. She passed through the first summer making good gains and growing. At the beginning of the inoculation period she weighed 685 lbs. at the close (April 4, 1900), 805. After this she passed her first and second summers and second winter, much of the time in tick-infested pastures. August 10, 1901, she weighed 1060 lbs., and August 11 dropped a fine 77-lb. heifer calf.

Baroness of Alabam , (see Table I), a full blood Angus heifer, bred in Illinois; arrived in Auburn, Ala., November 8, 1899, at the age of 8 months, weighing 520 lbs. December 26 she was inoculated with 1 cc of defibrinated blood. The primary inoculation fever began about January 2 to 4, and continued until about January 22. The secondary inoculation fever appeared about the last day of January and first of February. Following the primary fever occasional irregular rises of temperature appeared. February 21, 1900, she received her second inoculation of 1½ cc of defibrinated blood; the 9th and 10th days following the inoculation she had fever, and on the 20th day she had a temperature of 104 morning and evening. The primary inoculation fever following her first inoculation was good and continued longer than usual, and the heifer then became sluggish and off her feed. At time of first inoculation she weighed 555 lbs.; near the close of the primary fever 540 lbs.; at the close of the inoculation periods (April 4), 570 lbs.; September 1, 1900, 700 lbs.; March 30, 1901, 810 lbs.

Charley Gardner, (see Tables I and II), an Angus bull, bred in Illinois, arrived at Auburn, Ala., November 8, 1899, at the age of 8 months, weighing 605 lbs. December 26, 1899, he was inoculated with 1 cc of defibrinated blood. An almost imperceptible primary fever appeared about January 1. The secondary inoculation fever began January 22 (27 days after the inoculation) and lasted abnot 10 days. At no time did his fever reach 104. On February 21, 1900, he received a second inoculation of 1½ cc of defibrinated blood. No fever followed this inoculation. After being infested with ticks some time in June or July, he had a rather severe attack of fever, beginning about August 10, when his temperature ran up to 107. This period of fever lasted three days; his temperature went up to 104-106 for four days. The fever checked his appetite and made him lose some in weight, but rumination, digestion and action of bowels were at no time completely suspended, as in Admiral's case.

August 8, 1900, just before the fever, he weighed 1015 pounds.

September 1, 1900, just after the fever, he weighed 930 pounds.

August 10, 1901, near close of his second summer, he weighed 1450 pounds, when about 30 months old.

REMARKS ON INOCULATION OF THE SIX CATTLE IN TABLE I.

One positive mistake that we made with the three full blood bulls which were inoculated at the same time as the three full blood heifers, was that they were not permitted to get ticks on them early in the spring immediately following recovery from the inoculation fever. The heifers were turned out with the herd cows and became infested with ticks early in the spring, while the bulls were kept by themselves in small pasture lot, and did not, in fact, get but few ticks on them until July, when the weather was hot, a dangerous time for fever. Another mistake was made in the second inoculation of all those that did not react well to the first inoculation. The second inoculation dose (coming from same source as first) should have been $2\frac{1}{2}$ cc instead of $1\frac{1}{2}$ cc. The fever must be produced by the inoculation at least once and if possible twice before the animal is safely immune. The temperature should run up to, at lowest, 104 to 105.

TABLE III.

Temperature Records of Northern-Bred Grades that were Inoculated with Defibrinated Blood.

DATE	S. H. GRADE		A. GRADE I		A. GRADE II		A GRADE III	
1899 – 1900	A. M.	P. M.	A. M.	P. M.	A. M.	P. M.	A. M.	P. M.
Nov. 24	102.0	102.0	104.0	103.0	102.0	102.6	102.6	105.0
Nov. 25	102.0	102.0	102.0	102.0	102.0	102.6	101.6	103.0
Nov. 26	102.0	102.0	102.0	102.6	102.0	102.0	102.2	102.6
Nov. 27	102.0	101.0	102.0	102.0	102.0	102.6	102.2	103.0
Nov. 28	102.4	103.0	102.6	102.0	102.0	103.0	102.0	102.0
Nov. 29	102.2	103.0	102.0	102.0	102.0	102.6	101.0	103.0
Nov. 30	102.4	103.0	102.0	102.6	102.2	102.4	101.4	103.0
Dec. 1	104.0	104.0	102.0	102.6	103.6	104.0	102.6	103.6
Dec. 2	102.4	103.6	102.0	103.0	102.2	103.0	101.4	104.0
Dec. 3	102.4	102.4	102.0	101.6	102.0	102.2	103.0	102.2
Dec. 4	103.0	103.0	102.2	102.6	102.4	102.0	103.0	103.4
Dec. 5	103.2	102.8	102.0	102.4	102.0	102.2	103.4	102.6
Dec. 6	100.0	102.0	102.0	103.0	102.0	102.0	102.6	104.0
Dec. 7	101.6	102.0	102.0	103.0	102.0	103.2	101.6	103.0
Dec. 8	101.0	102.0	102.0	102.6	102.4	103.0	101.6	103.0
Dec. 9	102.6	102.6	103.0	103.6	102.0	102.2	101.0	102.0
Dec. 10	102.0	103.0	102.6	103.6	102.6	103.0	102.6	103.2
Dec. 11	104.0	103.0	103.0	103.2	103.0	103.4	102.6	103.4
Dec. 12	100.0	103.0	102.0	103.4	102.8	102.0	102.0	103.6
Dec. 13	100.6	102.6	102.0	102.4	101.8	103.0	100.8	104.0
Dec. 14	102.0	103.4	102.4	103.0	102.0	103.2	102.6	103.4
Dec. 15	100.0	102.0	102.0	103.0	102.0	102.4	101.4	102.6
Dec. 16	100.2	102.6	102.4	103.0	102.0	103.0	102.2	103.4
Dec. 17	101.2	102.6	102.6	103.0	102.0	102.6	102.4	103.2
Dec. 18	102.0	102.6	103.0	103.0	100.0	102.0	102.0	103.0
Dec. 19	102.2	103.6	102.6	104.0	102.4	103.6	100.0	103.0
Dec. 20	102.2	103.2	102.0	103.0	102.2	103.0	102.0	103.4
Dec. 21	102.6	102.6	102.6	102.8	102.0	103.0	102.4	102.4
Dec. 22	102.0	102.2	102.6	102.6	102.4	103.0	102.6	102.8
Dec. 23	101.0	102.0	102.6	103.0	102.0	103.0	101.0	103.0
Dec. 24	102.2	102.4	102.6	102.6	102.4	103.0	102.0	102.6
Dec. 25	101.0	102.0	102.4	103.0	102.0	102.4	102.2	102.4
Dec. 26	100.8	102.0	102.0	102.6	102.4	103.0	102.2	102.4
Dec. 27	100.0	102.0	102.4	103.0	102.2	102.6	102.2	102.6
Dec. 28	102.6	102.6	102.6	102.6	102.4	102.6	102.0	102.6
Dec. 29	102.0	102.0	102.6	103.0	102.4	102.0	102.0	103.0
Dec. 30	102.2	102.4	102.6	103.0	102.4	102.6	102.0	102.6
Dec. 31	102.0	102.4	102.6	103.2	102.0	102.4	102.4	102.6
Jan. 1	101.0	102.0	102.4	103.2	102.0	102.6	102.2	102.4
Jan. 2	102.0	102.2	102.0	102.2	101.6	102.0	102.4	102.6
Jan. 3	102.0	102.4	101.4	102.6	101.0	102.0	102.2	103.0
Jan. 4	102.2	102.6	102.0	102.2	102.0	102.2	102.0	105.0
Jan. 5	102.0	102.2	102.6	102.6	102.0	102.2	101.2	102.0
Jan. 6	101.0	102.0	102.2	102.6	102.4	102.6	102.0	102.0
Jan. 7	102.0	102.2	102.6	103.0	102.6	102.6	102.4	102.6
Jan. 8	102.0	102.4	102.0	102.4	102.2	102.6	102.0	102.2
Jan. 9	102.2	102.6	102.4	102.6	102.6	103.0	102.6	103.0
Jan. 10	101.6	103.0	102.6	103.0	102.6	102.6	102.0	102.6

TABLE III.—Continued.

DATE	S. H. GRADE		A. GRADE I		A. GRADE II		A. GRADE III	
1899—1900.	A. M.	P. M.	A. M.	P. M.	A. M.	P. M.	A. M.	P. M.
Jan. 11	103.0	103.0	102.6	103.0	103.0	103.2	103.4	103.0
Jan. 12	102.2	101.6	102.0	102.0	102.6	102.4	103.0	102.6
Jan. 13	102.2	102.0	102.0	102.4	102.6	102.6	102.6	103.0
Jan. 14	101.6	102.0	102.6	102.6	102.6	103.0	102.0	102.6
Jan. 15	102.4	102.6	102.6	102.6	103.0	102.6	102.6	102.4
Jan. 16	102.6	102.0	102.6	102.4	103.0	102.6	102.6	102.6
Jan. 17	102.2	102.4	102.6	102.0	103.0	102.6	102.0	102.0
Jan. 18	103.0	102.6	103.2	102.4	103.4	103.0	103.0	102.2
Jan. 19	103.0	102.4	103.0	102.4	103.6	103.0	102.6	102.2
Jan. 20	102.2	102.4	102.2	102.6	103.6	103.0	102.0	102.6
Jan. 21	102.4	102.6	102.0	102.6	102.6	103.0	102.0	102.6
Jan. 22	102.0	102.4	103.0	102.0	102.6	102.2	102.0	102.2
Jan. 23	102.0	102.2	102.0	102.4	102.6	102.6	102.2	102.6
Jan. 24	.....	102.4	.....	102.2	.....	102.6	.....	102.0
Jan. 25	102.0	102.6	102.0	102.6	103.0	102.6	103.0	102.2
Jan. 26	102.0	102.4	102.0	102.6	102.6	102.4	102.4	102.6
Jan. 27	102.0	102.4	102.0	102.6	102.6	103.0	102.0	102.4
Jan. 28	102.0	102.2	102.0	102.6	102.2	102.4	102.0	102.2
Jan. 29	102.0	102.2	102.0	102.6	102.6	103.0	102.0	102.2
Jan. 30	101.4	102.0	102.0	102.0	102.0	102.2	101.6	102.0
Jan. 31	102.4	102.6	102.4	102.6	102.6	103.0	102.4	102.6
Feb. 1	102.2	102.0	102.0	102.4	102.6	102.0	101.0	102.0
Feb. 2	102.4	102.0	102.6	103.0	103.0	103.0	103.0	103.2
Feb. 3	102.0	102.0	102.0	102.2	102.6	102.2	102.0	103.0
Feb. 4	102.4	102.0	102.6	102.6	102.6	102.4	102.6	102.6
Feb. 5	102.0	102.0	102.4	102.0	102.6	102.4	102.4	102.0
Feb. 6	103.0	102.6	103.0	102.6	102.6	102.4	102.6	102.4
Feb. 7	103.2	102.6	103.0	102.0	103.0	102.2	102.6	102.0
Feb. 8	104.0	103.0	103.2	102.6	103.2	103.0	103.0	102.6
Feb. 9	102.6	102.0	103.0	102.6	102.6	102.6	102.0	102.0
Feb. 10	103.0	102.6	103.0	102.6	102.6	102.4	102.2	102.2
Feb. 11	102.0	102.0	102.6	102.0	102.6	102.0	102.0	101.6
Feb. 12	103.4	103.0	102.6	102.0	103.0	102.6	103.0	102.6
Feb. 13	102.6	102.4	102.0	102.4	103.0	102.6	102.0	102.0
Feb. 14	102.6	102.0	102.0	103.0	102.0	102.0	102.6	102.0
Feb. 15	102.0	102.2	102.0	102.6	102.6	102.6	103.0	103.0
Feb. 16	102.6	103.0	102.0	102.6	102.4	102.2	102.4	102.0
Feb. 17	102.6	102.6	102.0	102.4	102.2	102.4	102.2	102.0
Feb. 18	102.6	102.4	102.0	102.0	102.4	102.0	102.0	102.0
Feb. 19	102.6	102.0	101.2	102.6	102.0	102.2	102.0	102.0
Feb. 20	101.6	102.0	102.0	102.4	102.4	102.6	103.0	102.6
Feb. 21	102.2	102.6	102.0	102.2	102.4	102.6	102.4	102.6
Feb. 22	102.0	102.2	102.0	102.1	102.6	102.2	102.6	102.4
Feb. 23	101.2	.....	102.0	.....	102.6	.....	102.6	.....

The four Northern-bred grades that were brought to Auburn, Ala., November 8, 1899, with the six full bloods, were inoculated one month before the full bloods, and were differently handled and fed. They were all inoculated the first time November 24, 1899, with 1 cc of defibrinated blood, derived from the same two-year-old Southern-bred Jersey heifer; and on January 24, 1900, they all received a second inoculation of 1½ of defibrinated blood. During the inoculation periods they were fed small rations of bran and very poor hay; housed at night and bad days, and allowed the run of a dry lot on good days. (See temperature records in Table III).

Shorthorn Grade Heifer, bred in Missouri, about 8 months old at time of arrival in Alabama, and weighed 320 lbs. The primary fever began about November 28 or December 1, and continued until about December 5th. and rose slightly again December 9, 10 and 11. Her temperature came up again December 18, and irregular slight elevations of temperature occurred until the second inoculation on January 24. During this first period a low fever prevailed, and the heifer exhibited weakness and an unthrifty condition. The low fever following the second inoculation was a little higher and more unbroken or continuous than the fever following the first inoculation. This heifer was not in good condition at the beginning of the inoculation periods, and was not fed a sufficient quantity of good feed during the fever. A liberal supply of good feed is always essential during inoculation fever. She was turned into a tick-infested pasture about March 1, and became so badly infested with ticks in April that it was necessary to get her up and treat her with kerosene oil emulsion in order to remove them. This heifer did make some growth during her first summer, but did not begin to improve in a normal, healthy manner until the spring of 1901. September 1, 1901, she weighed about 800 lbs.

Angus Grade Heifer No. I; bred in Illinois, about 8 months old at time of arrival in Auburn, Ala. About December 8 the primary reaction began. Slight irregular rises of temperature occurred every few days until second inoculation on January 24, 1900. Primary reaction began about February 6, and lasted about 4 days. February 23 she was turned into tick-infested pasture with the herd, and became infested with ticks early in the spring. She made good gains in flesh during the summer, and on November 10, 1900, weighed 725 lbs. During the second summer she developed without any checks, and now weighs about 900 lbs.

Angus Grade Heifer No. II, bred in Illinois, at time of arrival in Auburn, Ala., 8 months old, and weighed 415 lbs. Primary inoculation fever appeared about December 1. Secondary inoculation fever not very difinitely located, but probably began about January 9. Temperature rises were irregular and very mild, following both first and second inoculations. She never showed symptoms of ill health and at the end of the inoculation periods she weighed 490 lbs. She was turned into a tick-infested pasture and became infested with ticks early in the spring, and never showed any signs of sickness, weighing at the end of the first summer 670 lbs. At the end of the second summer she weighed about 800 lbs.

Angus Grade Heifer No. III; bred in Illinois, about 8 months old at time of arrival in Auburn, Ala., and weighed 420 lbs. About December 1 the primary reaction began. The secondary inoculation fever not very distinctly located unless January 7 to 13 or January 18 to 24 be so regarded. The primary reaction following the second inoculation began about February 3, and the secondary reaction appearing about February 20. No reaction is high or very distinctly located. This heifer was very wild and mean to handle, and was not fed during the first and second summers and the second winter, as were Nos. 1 and 2. At the end of the first summer she weighed 610 lbs., and in September, 1901, she weighs about 800 lbs. She became infested with ticks the first summer and several times since, but has never exhibited any signs of ill health.

TABLE IV.

Temperature Records of four Registered Angus Calves. Inoculated with Defibrinated Blood.

DATE	Barnes, H. I		Barnes, H. II		Barnes, B.		Little B.	
1900.	A. M.	P. M.	A. M.	P M	A. M.	P. M.	A. M	P M.
February 13	103.0	102.6	103.0	102.6	102.0	102.2	......	......
February 14	102.0	103.6	102.6	102.6	102.0	103.6	......	......
February 15	102.6	103.0	102.6	103.0	101.6	102.0	......	......
February 16	102.6	103.2	102.6	103.0	102.0	103.0	......	......
February 17	102.6	103.2	102.6	103.2	102.0	103.0	......	......
February 18	102.6	102.0	102.6	102.0	102.0	102.2	......	......
February 19	102.0	103.2	102.0	104.0	101.0	103.0	......	......
February 20	103.0	103.2	103.4	103.6	101.6	103.0	......	......
February 21	103.4	103.6	103.6	105.0	102.0	105.0	......	103.0
February 22	102.0	103.6	102.6	103.6	102.0	102.0	102.0	102.0
February 23	102.6	103.0	103.0	104.0	102.0	102.6	102.0	102.0
February 24	102.6	102.6	103.0	102.6	102.0	102.0	103.0	102.0
February 25	102.6	103.0	102.6	102.6	102.0	102.2	102.6	102.0
February 26	104.6	103.0	103.2	103.0	101.2	102.0	102.0	102.0
February 27	103.6	103.0	103.0	103.2	101.6	102.0	102.0	102.0
February 28	102.6	102.2	102.0	102.0	102.0	102.0	102.0	102.0
March 1	102.6	102.4	102.0	102.0	102.2	102.0	102.2	102.0
March 2	102.6	103.0	103.0	104.0	102.0	103.0	103.0	104.0
March 3	102.0	102.6	102.0	102.6	103.0	102.6	104.0	105.0
March 4	103.0	103.6	102.6	103.0	102.0	103.0	104.0	104.0
March 5	102.6	103.0	102.0	102.6	102.0	102.6	105.0	106.0
March 6	102.6	103.0	102.6	103.0	102.0	102.6	106.0	106.0
March 7	102.0	102.6	102.6	102.6	102.0	102.0	106.0	105.2
March 8	102.0	102.0	102.0	102.0	101.2	102.0	104.2	103.4
March 9	102.0	102.6	102.0	102.6	102.0	104.0	102.6	103.0
March 10	103.0	103.0	103.0	103.0	103.0	102.6	103.0	103.0
March 11	103.0	103.6	103.0	102.6	103.0	103.0	102.6	102.0
March 12	102.6	102.6	102.6	102.6	103.0	102.6	102.0	102.0
March 13	102.4	102.6	102.4	102.6	103.0	103.0	102.0	103.0
March 14	103.0	103.0	103.0	103.0	102.0	103.0	104.4	105.0
March 15	102.6	102.4	103.0	102.6	104.0	103.0	104.0	103.2
March 16	102.6	103.4	102.0	103.4	101.6	103.0	103.0	102.0
March 17	102.2	102.0	102.0	102.6	102.0	102.6	102.0	102.0
March 18	102.4	103.0	102.0	102.6	102.0	102.6	102.0	102.0
March 19	102.6	103.0	102.6	103.4	103.6	103.0	102.6	101.4
March 20	103.0	102.6	103.0	102.6	103.2	103.0	102.6	102.0
March 21	102.0	103.0	102.4	103.2	103.0	103.6	102.6	102.2
March 22	103.0	103.2	102.0	102.6	102.6	102.6	102.0	102.0
March 23	103.0	103.2	102.6	103.2	103.4	104.0	102.4	102.6
March 24	102.0	102.0	103.0	102.6	103.0	103.0	103.0	102.0
March 25	102.6	102.4	102.6	103.0	103.0	103.4	102.6	102.0
March 26	102.2	103.0	102.4	103.0	102.4	103.0	102.0	102.2
March 27	102.0	103.0	102.0	102.6	102.6	103.2	102.2	......
March 28	102.0	102.6	101.6	102.6	102.6	103.0	......	......
March 29	102.0	102.2	102.0	102.0	102.0	102.6	......	......
March 30	102.6	102.6	102.0	102.2	102.6	103.0	......	......
March 31	102.0	102.4	102.0	102.6	102.2	103.0	......	......
April 1	102.6	103.2	102.0	102.0	102.6	102.6	......	......
April 2	102.6	102.2	102.4	103.0	102.2	103.0	......	......
April 3	102.6	102.4	102.0	102.0	103.0	102.6	......	......
April 4	102.6	102.4	102.2	102.0	103.0	103.0	......	......
April 5	102.0	.....	102.0	.....	102.2	.....	......	......

In Table No. 3, "Barnes, H., I," "Barnes H., II," and "Barnes, B.," represent two heifers and one bull. They are full blooded Angus calves about 6 months old at time of their arrival in Alabama, and were bred in Illinois. February 11 they arrived in Auburn, Ala., and February 13 they were each inoculated with 1 cc of defebrinated blood derived from the same two-year-old Alabama-bred Jersey heifer. The inoculation fever periods are fairly well marked (see Table No. IV), but are somewhat irregular. These calves were fed shorts, corn meal, and received daily from 3 to 4 gallons of milk from two Alabama-bred Jersey cows. The milk very probably had no immunizing power, but it kept these calves in excellent condition to withstand the inoculation fever. They all grew and gained in weight during the inoculation period. April 5, 1900, they were taken to the home of their owner, Hon. R. B. Barnes, Opelika, Ala., where they have spent two summers without showing any symptoms of Texas fever. The heifers were turned into tick-infested pastures and the bull was kept by himself in a small pasture where he did not get many ticks on him the first summer. Consequently in November following the first summer the bull was given a second inoculation of 1½ cc of defibrinated blood. The cattle have suffered no inconvenience from the inoculation, and the exposure to tick inoculation during the second summer.

The "Little B." in Table No. IV. represents an Angus bull calf, bred in Missouri. He arrived at Auburn, Ala., February 20, 1900, and was then about 10 months old. This calf was small and thin at time of arrival, but on February 21 he was inoculated with 1 cc of defibrinated blood from the same Alabama-bred Jersey heifer. Notice by the table that his reactions or inoculation fever periods were better marked than were those of the

Barnes calves. This is partly due to the fact that he was older and was not fed milk to keep him stronger and better able to resist the micro-parasites. He was fed shorts, wheat bran and corn meal, and maintained a growing appetite and made good gains in weight during the entire 35 days he was in Auburn. When shipped to his owner, Mr. W. G. Little, Livingston, Ala., he could not be forced into the small crate in which he came to Auburn from Missouri. This animal has now passed two summers in Alabama, and has never exhibited any signs of Texas fever.

TABLE V.—Summary of Cattle Inoculated with Defibrinated Blood in Alabama.

No.	Owner.	Breed.	Age.	Native State.	Time of Arrival in Ala.	First Inoculation.	Dose.	Second Inoculation.	Dose.	Deaths from Inoculation.	Remarks.
3	Expt. Station,	Angus grades	8 mo's.	Ill.....	Nov. 8	Nov. 24	1cc	Jan. 24	1.5cc	.....	
1	" "	S. Horn grade	8 "	Mo....	"	"	1cc	"	1.5cc	.....	
1	" "	S. Horn Bull	8 "	Mo....	"	Dec. 26	1cc	Feb. 24	1.5cc	.....	
1	" "	S.Horn Heifer	1 year	Mo....	"	"	1cc	"	1.5cc	....	
1	" "	R. Poll Bull	1 "	Ill. ...	"	"	1cc	"	1.5cc	......	Had severe fever following Summer.
1	" "	R. Poll Heifer	1 "	Ill. ...	"	"	1cc	"	1.5cc	......	
1	" "	Angus Bull ..	8 mo's.	Ill. ...	"	"	1cc	"	1.5cc	......	
1	" "	Angus Heifer.	8 mo's	Ill.. ..	"	"	1cc	"	1.5cc	......	
1	Barnes,......	Angus Bull.	6 mo's,	Ill.....	"	Feb. 12	1cc	Nov.	1.5cc	......	Given Jersey milk during Inoc.
2	"	Angus Heifers	6 mo's.	Ill. ...	Feb. 9	"	1cc	....	....	......	" " " " "
1	Little......	Angus Bull ..	10 mo's	Mo....	"	Feb. 21	1cc	....	....	......	
1	Dumas.......	S. Horn Bull..	9 mo's.	Tenn. ..	Feb. 20	Nov	1cc	....	....	......	Passed first sum'r without fever
2	" ...	S. Horn H. ..	9 mo's.	"	Nov.	"	1cc	....	....	......	" " " " "
1	Mr. G	Herefords....	2 years	Mo...	"	Mch 13.	2cc	....	....	......	
1	T. and P.....	Jersey H.....	2 years.	Ky ..	Winter.	Mch 14.	2cc	....	....	1	The last nine were inoculated by Fred G. Matthews, of South Florence, Ala.
1	Sadler.	Jersey H.....	2 years.	Ky. ..	"	"	2cc	....	....	1	
1	Proctor	Jersey H.....	18 mo's.	Ky....	"	"	2cc	....	....	......	
1	Thurman. ..	Jersey B.	2 years	Ky....	"	"	2cc	....	....	......	
1	Cohens.	Jersey H.....	2 years	Ky....	"	"	2cc	....	....	......	
1	Nathan......	Jersey Cow ..	4 years.	Ky....	"	"	2cc	....	....	......	
1	"	Jersey Calf ..	6 mo's	Ky....	"	"	2cc			......	

The total number of cattle inoculated was 27, and out of this number two died of inoculation fever and one was seriously injured by severe attack of Texas fever as a result of tick inoculation the first summer. At least four others had the fever some time during the first summer but were not injured by it. Of the 18 inoculated by myself none were lost; one was seriously injured by tick inoculation the first summer, and four others had the fever in more or less mild form the first summer.

Clinical Notes on Dumas Short-Horns.

The two Shorthorn calves, owned by Dumas, of Arlington, Ala., were inoculated only once. (see Table V). This was done in November. The following August Mr. Joel Dumas writes me stating that about ten days after the calves were inoculated the primary inoculation fever appeared and continued about two weeks, the temperature ranging from 103 to 106. The heifer's temperature was invariably higher than that of the bull calf. During the high fever the bowels were kept active by drenching the calves with raw linseed oil, and when they would not eat they were drenched with milk. After recovery they were turned into a pasture with other cattle, and "have had ticks on them all along." He says: "My Shorthorn calves have done very well, and I think now they are perfectly immune." Nov. 1., these calves were safe.

Notes on the last nine cases in Table No. V:

F. G. Matthews, of Florence, Ala., inoculated these animals, and under date of April 8, 1901, writes me as follows:

"I first measured the dose in a small two drachm graduated, allowing something over a half drachm for a dose (2 cc). Nine head of cattle were inoculated. Seven of them were Jerseys (one 6 months old, one 18 months old, four were 2 years old, and one was 4 years old); they came from Kentucky; the other two were 2 year old Herefords, and came from the St. Louis market. All of these cattle were brought to Alabama during the past winter.

"The vessels used were sterilized by placing them in cold water and bringing it up to boiling.

"On the 13th of March I drew the blood from a native scrub bull, 18 months old, defibrinated it, and immediately inoculated the Herefords.

"On the 14th of March I drew 2 ounces of blood, prepared it, and immediately inoculated T. and P.'s 2-year-old Jersey cow; a few minutes later, Sadler's 2-year-old Jersey cow; about 15 minutes later Proctor's 18-month-old Jersey heifer; about 30 minutes later Thurman's 2-year-old Jersey bull; about an hour later Cohen's 2-year-old cow (she was in wood's pasture, and had to be hunted), and about an hour later we secured Nathan's 4-year-old cow and 6-month-old calf and inoculated both of them. (Numbered in the order named). Cows Nos. 1 and 2 died March 25. On that day the temperature of No. 3 was 104; No. 4, 103; No. 5, 105. March 26, No. 3, 107; No. 4, 103; No. 5, 105; Nos. 6 and 7, 104. No. 3 was too weak to stand up long at a time. March 27, No. 3, 105.5; No. 4, 102.5; No. 5, 102.5; Nos. 6 and 7, 105. These temperatures remained this way for several days and then subsided. The animals suffered loss of appetite one or two days. The bull's temperature went up again in a few days to 104, and No. 3 developed a swelling under the throat and weeping at the eyes—these conditions passed off in a few days.

"I can not understand why Nos. 1 and 2 should have died and No. 3 became so violently affected when all others took the regular or normal course. Possibly the severity of the fever in these three cases was due to the freshness of the blood at the time they were inoculated, the blood being somewhat old at the time the others were inoculated."

"Very respectfully,

"Fred G. Matthews."

The time of year when these 9 head of cattle were inoculated was not altogether suitable—the weather was a little too warm. The best time of year for inoculation is from November 1st to March 1st. Moreover, some of these cattle were too old to be inoculated with safety, and the dose of defibrinated blood was too large for a single or first inoculation. The strength of the blood of an immune animal is never known until it is tested by inoculation; hence it is always safest to use the minimum dose in the beginning or the first time the blood is used. All of these animals should have been collected at one place so that there would have been no delay in the inoculations following the drawing of the blood and the defibrinating it. The vessels were not sufficiently sterilized. They should have been boiled at least for thirty minutes, and for safety one hour.

TABLE VI—SUMMARY OF NORTHERN-BRED CATTLE SHIPPED INTO ALABAMA IN THE LAST 3 YEARS and acclimation attempted by natural tick inoculation.

No.	Age when brought to Alabama.	Sex.	State where bred.	Breed.	Owner.	County in Alabama.	Died of Texas Fever	Living and acclimated.	REMARKS.
1	1 year.	bull	.....	Polled Durham...	....	Wilcox	....	1	
1	8 mo's.	heifer..	....	Red Poll	Lambert	" ...	...	1	Kept away from Southern cattle.
1	18 mo's.	"	....	" "	"	"	..	1	Separated from herd cattle.
2	14 mo's.	bulls..	.....	" "	"	"	2	....	Allowed to run with herd
2	18 mo's.	"	....	" "	"	"	...	2	Well cared for and isolated.
2	3–5 yrs.	cows ...	....	" "	"	"	1	1	
1	4 yrs.	bull ..	Tenn ..	" "	....	" ...	1	.....	
1	1 yr.	"	.....	R. P.& S. H.Cross	....	" ...	....	1	Kept isolated.
1	1 yr.	"	....	Shorthorn.......	....	" ...	....	1	" "
1	18 mo's.	"	.....	"	....	" ...	....	1	
1	2 years,	"	....	Red Poll........	....	"	....	1	
1	45 days.	"	......	Devon..........	....	"	1	.....	
1	45 days.	"	.....	"	....	" ...	....	1	
2	18 mo's.	heifers	....	Red Poll	....	" ...	....	2	
1	9 mo's.	bull ..	Ill	Angus	Kernachan....	Colbert...	.....	1	Well cared for.
1	"	heifer	"	"	"	" ...	.....	1	" " "
1	1 year.	"	Tenn.	"	"	" ...	....	1	" " "
1	"	bull ..	Mo. ..	Hereford	Swope.	La wrence.	.....	1	Isolated and stabled.
5	2 yr's.	heifers.	"	"	"	" ...	.....	5	" " "
1	9 mo's	bull ..	Ill. ..	Angus....	Hare..... ...	Monroe	....	1	
3	10-18mo	bulls..	Penn...	Devons.........	....	Chambers.	1	2	
15	"	heifer	"	"	....	" ...	4	11	
1	3 yrs.	bull ..	"	"	McGehee	" ...	....	1	Isolated and stabled.
1	8 mo's.	"	....	Shorthorn.	Davis.........	" ...	.....	1	
1	"	heifer..	....	"	"	" ...	......	1	

TABLE VI—Continued.

1	4 yrs	bull	Tenn.	Red Poll grade	Jones	Lee	....	1	Taken to Florida before summer.
1	4 yrs.	cow	"	" "	"	"	1	....	Died of Texas Fever in July.
1	3 yrs	cow	"	S. P. & R. P. Cross	"	"	1	....	
1	5 yrs.	cow	"	" "	"	"	....	1	
1	18 mo's.	heifer.	"	Shorthorn, grade.	"	"	1	....	
1	7 mo's.	heifer	"	Red Poll, grade.	"	"	....	1	
9	1 year.	....	Neb	Shorthorn	McLatchy	Washington	2	7	Two of the 7 sick at time of report
1	15 mo's.	bull	Ohio	"	Talson	Etowah	....	1	Kept isolated.
1	16 mo'f	heifer	"	"	"	"	....	1	" "
1	....	bull	....	Red Poll grade	Hamilton.	"	....	1	
1	1 yr	bdll	Mo	Hereford	Rodgers	Sumter	....	1	
2	1 yr	h ifer	Mo	"	"	"	2	....	
1	1 yr	bull	Ohio	Red Poll, grade	McCain	"	1	....	
1	1 yr	bull	Tenn.	" "	McCain & Cobb.	"	....	1	
1	1 yr	bull	"	" "	Horn	"	....	1	
1	1 yr	bull	"	" "	Scarborough.	"	....	1	
1	1 yr	bull	"	Angus	Thornton	"	...	1	
1	6 mo's	bull	Ill.	"	Ennis	"		1	
2	6 mo's.	heifer.	Ill.	"	"	"	...	1	
1	6 mo's	h ifer	Tenn,	Shorthorn	Paul Gee	"	....	1	Had Texas Fever and recovered.
1	6 mo's.	bull	"	"	" "	"	....	2	" " " " "
1	6 mo's.	heifer	"	Red Poll	" "	"	....	1	" " " " "
2	6 mo's.	heifers	"	Shorthorn	R. H. Seal	"	....	1	" " " " "
2	9 mo's.	heifers	"	"	Seymour.	"	...	2	
1	9 mo's.	bull	"	"	"	"	....	2	

TABLE VI.—Cont'd.

Summary of Northern-Bred Cattle shipped into Alabama in the last three years, and acclimation attempted by natural tick inoculation.

No.	Age when brought to Alabama.	Sex.	State where bred.	Breed.	Owner.	County in Alabama	Died of Texas Fever.	Living and acclimated	Remarks.
10	6-12 mos	3 b, 7 h	Tenn.	Shorthorn	F. I. Derby	Sumter	2	8	
2	6-22 mos	1 b, 1 h	"	"	J. Sims	"	1	1	
1	6 mo's.	heifer	"	"	Wallace	"	1	.....	Died second year.
1	1 yr	bull	.....	"	Comer	Bullock	.....	1	
1	3 yrs	bull	.....	"	"	"	.....	1	
4	4 yrs	cows	.....	"	"	"	1	3	
1	4 yrs	cow	.....	Jersey	Haughton	"	.....	1	
1	1 yr	bull	.....	Shorthorn	Foster	"	1	.....	
3	1 yr	heifers	.....	"	"	"	3	.....	
1	2 yrs	heifer	.....	"	"	"	.....	1	
1	2 yrs	heifer	.....	Jersey	"	"	.....	1	
5	1 yr	1 b, 4 h.	Miss (?)	Herefords	Rainer	"	3	2	Ship'd Mch from Columbus, Miss.
1	7 mo's.	bull	Tenn.	Shorthorns	Culver	"	.....	1	Shipped in October to Ala.
2	7 mo's.	heifers	"	"	"	"	.....	2	" " " " "
1	8 mo's.	bull	.....	Angus	Goldthwaite	Montgom'y	.....	1	Weight 1400 lbs, at about 30 mo's.
1	5 mo's	bull	.....	Short horns	Marks	"	.....	1	Shipped Nov. 1899. to Ala.
2	8 mo's	1 b, 1 h	.....	"	Gunter	"	.....	2	
2	8 mo's.	1 b, 1 h	.....	"	P. Tyson	"	.....	2	
4	6 mo's.	1 b, 3 h.	.....	"	McLemore	"	1	3	
3	8 mo's.	1 b, 2 h	.....	"	T. W. Oliver	"	..	3	
1	.....	cow	.....	"	Smith	"	.....	1	
2	.....	1 b, 1, c.	.....	Red Poll	"	"	.....	2	
1	.....	bull	.....	Polled Durham	"	"	.....	1	
2	.....		.....	Short horns	Torbert	Lee		2	

The total number of Northern–bred cattle on this list is 139. This, however, does not include all the Northern-bred animals shipped into Alabama during the past three years. There were many others brought into Alabama during the same period but we were unable to get authentic reports about them.

Of the total number reported (139), there were 31 fatal cases of fever; or 22.3 per cent. of the entire number died of Texas fever from inoculation, At the same time it should be noted that some of these cattle are still susceptible to Texas fever because they have been kept entirely free from ticks. Comparing the results (22.3 per cent. loss) with about 10 per cent. of deaths of Dr. Francis, where 1500 cattle were inoculated with defibrinated blood to produce immunity, gives a decided favorable balance for the new inoculation method. Or, compare the 22.3 per cent. loss with the 8 per cent. of deaths as shown in the summary of defibrinated blood inoculations made in Alabama.

In order to aid Alabama farmers who may desire to embark in the stock business by buying Northern-bred cattle, the veterinarian of the college and station will inoculate such animals with defibrinated blood, providing his expenses are paid to and from the place where cattle are to be inoculated. Parties desiring such inoculations will please notify the veterinarian in advance so that a date may be fixed to suit his convenience.

All farmers who have bought Northern-bred or foreign-bred cattle into Alabama at any time during the past three years will do us a great favor by reporting the results of their respective attempts at acclimating their cattle. Please give the age of each animal at time of arrival in Alabama; sex, breed, State from whence they came, how long said cattle have been in Alabama, how many are safely acclimated, with method of acclimating, and how many died with Texas or acclimating fever. If a number of animals were acclimated, the report may be tabulated as in Table VI.

We also solicit reports of all contagious or infectious diseases occurring among farm animals in Alabama. In case of serious or alarming outbreaks report directly to the veterinarian, and if possible, and best, he will at once visit the locality to determine the cause, and suggest ways of preventing and treatment.

I wish to take this opportunity to thank all those who so kindly sent in reports, and hope this bulletin will in part repay them for their trouble. I am especially thankful to Mr. R. W. Clark, who has charge of the stock at the Experiment Station, and who so carefully and faithfully looked after ten of the inoculated cattle that were directly in his care.

REMEMBER.

1.—That an animal sick with Texas fever can not infest or transmit the disease to healthy cattle.

2.—That the only known means by which the microparasite that causes Texas fever can be transmitted from diseased cattle to healthy ones is through two generations of the Southern cattle tick.

3.—That tick-free cattle never have Texas fever as long as they are tick-free.

4.—That cattle with Texas fever have or have had ticks upon them.

5.—That all cattle must acquire immunity after birth by having one or more attacks of Texas fever.

6.—That immunity to Texas fever is not inherited.

7.—That Southern-bred cattle have Texas fever when very young (sucking calves), and are usually but slightly affected by it.

8.—That the older the animal the more severe the fever; the older the animal the greater the mortality.

9.—That all cattle north of the government quarantine line are susceptible to Texas fever.

10.—That all Southern-bred cattle raised on tick-free farms and tick-free town lots are susceptible to Texas fever.

11.—That immune cattle will lose their immunity if kept free of ticks for two or more years.

12.—That in hot weather Texas fever is usually more acute and fatal than in cool seasons.

13.—That the best time to bring Northern-bred or foreign-bred cattle into Alabama is between November 1st and March 1st.

1.—That it is safer to bring young sucking calves into Alabama for acclimation than cattle over one year old.

15.—That sucking calves (2 to 4 months old,) can be shipped into the South by express; fed milk from a Southern-bred and immune cow, and be made immune by natural tick innoculation with a great degree of safety or little danger of loss.

16.—That one or two inoculations with defibrnated blood derived from an immune animal will produce a relatively safe immunity to Texas fever.

17.—That the best age for inoculating with defibrinated blood is one year or less.

18.—That the best time for the inoculation is from November 1st to March 1st.

19.—That inoculations should not be attempted in hot weather.

20.—That pregnant cows are liable to abort when they have inoculation or Texas fever.

21.—That inoculated animals should receive the best of feed and care during and after the inoculation fever.

22.—That from 50 to 90 per cent. of Northern-bred or susceptible cattle die with Texas fever when they are turned into tick-infested pastures, and allowed to rustle for themselves.

23.—That less than 10 per cent. of susceptible cattle are lost when they are made immune by the defibrinated blood inoculation method; about 3 per cent. die with the inoculation fever, and about 7 per cent. die with Texas fever as a result of tick inoculation during the first summer.

24.—That it is best to keep all cattle from becoming literally covered with ticks.

25.—That if you are adjacent to the government quarantine line it is best to exterminate all the ticks on your farm and farm animals.

NOTICE—Parties who are interested, and who may desire a Farmers' Institute held in their town or city, will please write the veterinarian of the college and station, stating when they desire the institute, and about how many farmers they can get to attend said meeting. Our funds for this work are limited, but we aim to visit as many counties as possible with our means during the year. We can visit one or two places each month while college is in session, and a number of counties during the summer vacation. Dr. C. A. Cary is Official Director of Farmers' Institute for the station and college.

BULLETIN No. 117. DECEMBER, 1901.

ALABAMA.

Agricultural Experiment Station

OF THE

AGRICULTURAL AND MECHANICAL COLLEGE,

AUBURN.

ORCHARD NOTES.

By C. F AUSTIN.

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The Bulletins of this Station will be sent free to any citizen of the State on application to the Agricultural Experiment Station, Auburn, Alabama.

ORCHARD NOTES.

The season of 1901 was in many respects a favorable one for Alabama fruit-growers. The very mild preceeding winter had left the trees in excellent condition. Some of the earlier blooming plums escaped the frost and bore a good crop. The crop of fruit in the Experiment Station orchard was not as large as that of the preceding year; but it must be stated that the crop secured during 1900 was unusually large. The spring of 1901 was very late, wet and cold, and, therefore, prevented in many varieties a normal setting of fruit. As a result of the late spring the earlier varieties fruited from one to two weeks later than usual.

The young apple orchard planted in the years 1897 and 1900 continues to be very promising. Nearly every variety made a strong, vigorous growth during the past season. The method of treatment was the same as outlined in Bulletin 112, and has proven satisfactory. Some of the varieties planted in 1897 bore their first fruit this season.

Observations as to the prevalence of apple leaf rust (*Roestelia*) showed that the following varieties were affected:

Aikin, slightly.
Babbitt, slightly.
Battyani, slightly.
Buncomb, slightly.
Bledsoe, slightly.
Bradford, slightly.

Benoni, slightly.
Cillagos, slightly.
Cannon Pearmain, slightly.
Carolina Greening, very badly.
Cooper's Red, slightly.
Carter's Blue, very baldy.
Chattahooche, very badly.
Dam, slightly.
Early Harvest, slightly.
Elgin Pippin, slightly.
Equinettelee, badly.
Family, very badly.
Grime's Golden, slightly.
Hands, slightly.
Homing, slightly.
Haygood, very badly.
Jeffries' Everbearing, slightly.
Jonathan, very badly.
Julian, badly.
Keeskemet, slightly.
Moultries, badly.
Mangum, badly.
Marvina, badly.
Nickajack, very badly.
Mavarack Sweet, slightly.
Oszi-vaj, slightly.
Pear (or Palmer), slightly.
Red Limbertwig, slightly.
Rawls Janeton, slightly.
Red June, badly.
Rome Beauty, very badly.
Red Beitigheimer, slightly.
Rodes Orange, very badly.
Sekula, slightly.
Summer Wafer, slightly.

Shockley, very badly.
Senator, very badly.
Santa, badly.
Sweet Bough, slightly.
Thornton's Seedling, slightly.
Taunton, slightly.
Texas Red, slightly.
Walalyfi, badly.
Yellow English, slightly.
Yopp's Favorite, very badly.
Yellow Horse, slightly.
York Imperial, slightly.

The following varieties were free from rust this season:

Apple of Commerce.
Arkansas Black.
Buda Summer.
Black Ben Davis.
Champion.
Cooper's Early.
Epir.
Fanny.
Fall Pippin.
Garvenstein.
Hyari Piros.
Hershall Cox.
Hew's Crab.
Jennings.
Kennard's Choice.
Maggar.
Metell.
Mammoth Black Twig.
Maiden Blush.
Noble Savor.

Pasman.
Ponjik.
Red Astrachan.
Early Red Margaret.
Sabadka.
Summer Queen.
Saxon Priest.
Selymes.
Summer Cheese.
Shackleford.
Tuscaloosa Seedling.
Winesap.
Yakor.
Yates.

Early Red Margaret, Sabadka, Winesap, and Yakor which showed rust last year, escaped this, and, in addition to those affected last year, there are thirty-four more varieties affected this season. A greater number of the Hungarian varieties were affected this year than last year. Resistant varieties have for the past few seasons been giving a good deal of promise, but this season so many more varieties were affected than usual, that it is probable we have no varieties in our orchard that are perfectly resistant to the disease.

Spraying to Prevent Rust.—To determine if very thorough spraying with Bordeaux mixture would have any effect upon the rust, one tree of each variety was selected and kept very carefully sprayed from early spring until late in the fall. The Bordeaux mixture was used at the rate of six pounds of copper sulphate and six pounds fresh lime to fifty gallons of water.

The varieties selected for this spraying experiment were affected during the season of 1900 as follows:

Carter's Blue, slightly.
Cooper's Red, moderately.

Dam, slightly.
Early Red Marguerite, badly.
Family, very badly.
Hames, slightly.
Horse, moderately.
Jonathon, very badly.
Red June, slightly.
Santa, badly.
Senator, badly.
Shockley, badly.
Thornton's Seedling, slightly.
Winesap, slightly.
Yakor, slightly.

The trees were very carefully sprayed on the following dates during the season: March 24th, before growth started; April 25th, May 4th and 22nd, June 5th and 20th, July 23rd, August 9th and 28th.

On October 10th the trees were examined and the following notes taken showing the relative amount of rust on the sprayed trees. The trees at this time were heavily covered with the Bordeaux mixture:

Carter's Blue, badly.
Cooper's Red, badly.
Dam, slightly.
Early Red Marguerite, very badly.
Hames, slightly.
Horse, moderately.
Red June, slightly.
Jonathon, very badly.
Santa, very badly.
Senator, very badly.
Shockley, very badly.
Thornton's Seedling, slightly.
Winesap, slightly.
Yakor, slightly.

This seems to indicate that spraying with Bordeaux mixture has no effect upon the disease. Some of the varieties were even more affected this season than last. In reviewing the work of the past few seasons, it may be said that the rust is gradually increasing throughout the orchard. At present there are but few varieties that have not been at least slightly affected with the rust. While many of the varieties have not been affected so as to show reduced growth, many others have received a very serious setback from this cause.

The Green Aphis of Apples.—This insect has been very troublesome this season, and spread upon many varieties not attacked before.

The following varieties have been more or less affected:

Aikin, badly.
Apple of Commerce, very badly.
Battyani, badly.
Black Ben Davis, very badly.
Bledsoe, slightly.
Benoni, slightly.
Carolina Green, badly.
Cooper's Red, badly.
Cooper's Early, badly.
Early Harvest, slightly.
Elgin Pippin, badly.
Epir, very badly.
Family, badly.
Garvenstein, slightly.
Horse, very badly.
Jeffries' Everbearing, very badly.
Jennings, slightly.
Mammoth Black Twig, very badly.

Moultries, very badly.
Mangum, very badly.
Mamma, slightly.
Noble Savor, badly.
Nickajack, slightly.
Mavarack Sweet, slightly.
Os-zi-vaj, badly.
Pear (or Palmer), badly.
Red Limbertwig, badly.
Rawls Janeton, very badly.
Red Beitigheimer, very badly.
Red Margaret, slightly.
Summer Queen, very badly.
Saxon Priest, badly.
Shockley, slightly.
Senator, very badly.
Summer Cheese, slightly.
Sweet Bough, badly.
Shackleford, badly.
Texas Red, slightly.
Tuscaloosa Seedling, slightly.
Winesap, badly.
Wealthy, slightly.
Yellow English, badly.
Yakor, slightly.

This agrees to some extent with last year's report. There were sixteen varieties attacked this season that were not last, and thirteen varieties that were attacked last year that are free this. As in the case of the rust, the varieties that are resistant to the attack of the insects are becoming fewer every year. The indications are that there are no varieties that we can say are perfectly resistant to the attacks of this insect.

List of Hardy Varieties.—The following have been free from rust, aphis, and leaf spot for the past three seasons: Hyari Piros, Magyur, Maiden Blush, Metell, and Ponyike. There were eight hardy varieties last year and only five this. Three of the American varieties —Aikin, Babbitt and York Imperial—were slightly attacked with rust. Of the varieties that are not in the above list, but that have made a satisfactory growth, and are in good condition this fall are the following:

Aikin.	Jennings.
Arkansas Black.	Keeskemet.
Babbitt.	Kinnard's Choice.
Battyan.	Limbertwig.
Buncomb.	Mavarack Sweet.
Bradford.	Red Astrachan.
Bledsoe.	Summer Wafer.
Carter's Blue.	Selymes.
Champion.	Yakor.
Epir.	York Imperial.
Elgin Pippin.	Wilalyfi.
Gravenstein.	

The following varieties fruited for the first time this season: Bledsoe, Champion, Red Limbertwig, Thornton's Seedling, and Whalye.

The work with the bearing orchard has been along the line of spraying with Bordeaux mixture as a preventative against summer rot* and other diseases that cause the decay of fruit before maturity. As the first test along the line it was decided to keep the orchard very thoroughly sprayed from early spring until the fruit was ripe. The orchard was sprayed nine times

*We use the term summer rot to denote all the kinds of rot as a class. The one rot very noticeable this season was what is known as black rot (Sphæropsis malorum).

during the summer at the following dates: March 27th, before growth started; April 8th and 25th, May 22nd, June 5th and 22nd, August 9th and 28th. Paris green was used, after the blossoms had fallen, at the rate of eight ounces to fifty gallons of the mixture, which was the same as that used in spraying for apple rust. Care was taken to cover the whole tree very thoroughly, and especially the fruit.

Notes on Varieties.—The varieties that were practically free from rot are: Early Harvest, Hames, Hews' Virginia, Hiley's Eureka, Hubersham Late, Prior's Red, Red June, Summer Red, Thornton's Seedling, Shockley, Stephens' Winter, Winesap.

Varieties only slightly affected by the rot: Ben Davis, Golden Pippin, Horn, Kellageskee, Limbertwig, Red Astrachan, Rome Beauty, Rawls' Janeton, Shannon Pippin, Terry's Winter, Yopp's Favorite.

Varieties which rotted badly: American Golden Russett, Cannon Pearmain, Elgin Pippin, Red Limbertwig, Yellow English.

The growing of apples is a very difficult problem so far South, and without spraying a greater per cent. of the apples are more or less rotten before they are ripe. The orchard was an old one, and has had very little treatment. It was full of all kinds of diseases and insects that had flourished at will.

The work of the fruit season seems to point to the conclusion that by careful selection of varieties, good cultivation, and thorough spraying, good clean apples can be grown here from June until early winter. The old trees this season have made a good, strong, healthy growth.

CHERRIES.

In the spring of 1898 eleven of the leading varieties of cherries were planted. All of the trees of three of the varieties have died. Several more are making a struggle for existence. Four of the varieties have made a good strong growth and seem to be fairly hardy in this climate. They are: Deyhouse, Governor Wood, Ostheimer, and Suda. These varieties all bloomed full and gave promise of a heavy fruitage this season, but when the fruit was about half grown the bulk of it dropped off. Whether this peculiarity is due to the climatic conditions or to the trees not being old enough can not at present be determined.

Although cherries can not be recommended for general planting they should be in the list of the home garden for the northern half of the State.

Varieties.	No. of trees set 1898.	No. of trees alive 1901.	General condition in the fall 1901.
Abbasse........	2	1	Fairly strong and vigorous.
Black Tartarian	2	1	Weak and growth poor.
Dyehouse	1	1	Vigorous and strong with a good growth
Early Richmond	1	0	
English Morello	1	0	
Governor Wood.	2	1	Vigorous, good healthy growth.
Mont. O. King.	2	2	Fairly vigorous. growth small.
Napolean.......	1	0	
Ostheimer......	2	2	Strong and vigorous with a good growth
Suda...........	2	2	Strong and vigorous with a good growth.
Wragg..........	2	2	Vigorous, fair growth.

JAPAN WALNUTS.

Trees were set in 1896. They fruited for the first time this season. The nuts are of medium size, borne in large clusters, from six to twelve; shell is a little thicker than that of the English walnut, which they resemble to some extent. The meat is sweet and of good quality, the tree bears early and is a very rapid grower. It makes a handsome tree, having leaves of immense size. It should be included in the list for home planting throughout the State.

PEACHES.

The peach orchard has done well this season, for while the crop has not been large, nearly all varieties have borne some fruit. A coöperative experimental orchard was planted in 1898, at the request of a committee of the Association of Agricultural Colleges and Experiment Stations, for the testing of the geographical limits of the successful cultivation of the different races of peaches. The test consisted of three varieties of three trees each, of the five races of peaches. The orchard bore a good crop this season, and it is now possible to form some idea of their value.

Alexander.—An old standard sort. Medium, greenish, white, covered with red; flesh white, firm, juicy, sweet; clingstone. Season first to the middle of June; tree vigorous and productive. A leading early market sort.

Mt. Rose.—Medium to large, white, with red cheek; flesh quite firm, juicy, rich, sweet; freestone; a leading market variety; ripens from the first to the middle of July. Tree vigorous and usually quite productive.

Old Mixon.—This is another old variety. Medium to large, yellowish white, with red cheek; flesh white, very rich and juicy; freestone; a good shipper, and well known upon the market. Season from the middle to the last of July.

PEENTO RACE.

Varities—**PEENTO**, **WALDROW**, and **ANGEL**. The varietieth of this race bloom so early that the blossoms are all killed by the frost. See table of blooming period.

NORTH CHINA RACE.

Chinese Cling.—Large, globular, pale yellow; flesh very firm, sweet, rich; a close clingstone; a fine sort for pickling; season first to the middle of July. Tree vigorous and quite productive.

Elberta.—Large to very large, round oval, pale yellow unless fully ripe; flesh pale yellow, firm, rich, juicy, slightly acid; freestone; ripens last of July to first of August. Tree strong, vigorous and very productive. The leading market variety for the South.

Mammie Ross.—Large, round, white, with red cheek, and small red specks over the surface; flesh white, streaked with red under the skin; tender, juicy, sweet; clingstone; season first to the middle of July. Tree vigorous and productive. A promising new variety.

SOUTH CHINA RACE.

Pallas.—Medium, roundish, greenish yellow, with some red over the surface; flesh very white, sweet, rich; freestone; a promising variety for home use and local market; season middle of July. Tree vigorous and very productive. The best variety of the race.

Tabor.—Medium, roundish oblong, pointed, covered with red; flesh white, sweet, juicy; clingstone. Tree vigorous and fairly productive; ripens the last of July.

Honey.—Small, yellowish white, oval, slightly flattened, terminating in a prominent point; flesh very white, sweet, tender, juicy; freestone; season first of July. Trees are fairly vigorous and quite productive.

SPANISH RACE.

Imperial.—Medium to large, roundish oblong, greenish yellow, covered with reddish spots over the surface; flesh white, tender, juicy, sweet; freestone; season last of July. Tree vigorous and quite productive.

Onderkonk.—Small to medium, pale yellow, flesh yellowish, tender, juicy, good; freestone; ripens about the first of August. Tree vigorous and productive.

Cable's Indian.—Small, roundish, dull grayish red; flesh firm, reddish; clingstone; season first of August. Tree vigorous and productive.

Notes on the Blooming of the Races of Peaches for 1901.

Varieties.	Jan. 22.	Feb. 20.	Feb. 24.	March 4.	March 15.	March 26.	April 1.	April 6.
				PERSIAN	RACE.			
Alexander. ..	....	....	....	....	....	buds showing pink	full bloom..	blossoms falling.
Mount'in Rose	....	....	....	buds swollen..	first blooms.	full bloom..	....	....
Old Mixon....	....	....	....	buds swollen..	first blooms.	full bloom..	....	....
				PEENTO	RACE.			
Peento.	buds showing pink.	blooms fallen..	....	....	Blossoms	all killed by	the frost.	....
Waldrow.....	....	buds showing pink..	blooming...	....	Blossoms	all killed by	the frost.	....
Angel........	....	....	buds showing pink .	full bloom..	Blossoms	all killed by	the frost.	....
				NORTH CHI	NA RACE.	all killed by	the frost.	
Chinese Cling.	....	....	....	....	buds pink..	full bloom..	blossoms falling.	....

Notes on the Blooming of the Races of Peaches for 1901.

Varieties.	Jan. 22.	Feb. 20.	Feb. 24	March 4.	March 15.	March 26.	April 1.	April 6.
Elberta	....	....	....	....	buds opening.	full bloom..	blossoms fallen.	....
Mammie Ross.	....	....	....	....	buds pink.	full bloom..	blossoms falling.	....
				SOUTH CHINA RACE.				
Pallas......	....	....	....	....	buds pink..	full bloom..	blossoms fallen.	....
Tabor.......	....	....	....	....	buds pink..	blooming...	blossoms falling.	....
Honey ...	....	....	buds pink..	buds opening..	full bloom..	blossoms falling.	....	....
				SPANISH RACE.				
Imperial.	....	....	....	buds pink..	full bloom..	blossoms fallen.	....	....
Onderkonk...	....	....	buds swollen....	buds pink..	full bloom..	blossoms fallen.	....	....
Cable's Indian	....	....	....	buds swollen.	blooming...	full bloom..	....	....

The varieties of the Peento race bloom so early that they have no value outside the orange belt. The trees of the South China and Spanish races are strong, vigorous growers, and very productive. Many varieties of these races are suitable for the southern half of the State and coast region for home use and local market. As yet neither race contains any varieties that will compete with the leading market sorts of the Persian or North China races. A variety of peaches containing the vigor and productiveness of the trees of the South China and Spanish races, with the size, color, appearance and general market qualities of the Persian and North China races would be a valuable addition to Southern peach growing.

NOTES ON OTHER VARIETIES OF PEACHES.

Carmen —Large, nearly round, white with red cheek; flesh firm, white, rich, juicy, slightly acid; nearly free; season first to middle of July. Tree vigorous and productive. A promising variety for general planting.

Early Crawford.—An old standard variety; large, oblong oval, rich yellow with a red cheek; flesh yellow, firm, rich, slightly acid; season middle to last of July. Tree vigorous and usually productive. Under favorable conditions this is one of the leading commercial varieties. It wants a rich heavy soil to do its best, for upon poor land it is a shy bearer.

Grey.—Medium to large, rather long and flattened, with a prominent point at the end; skin very smooth, pale yellow, slightly sprinkled with red; flesh thick, firm, rich, sweet; freestone. Tree vigorous and quite productive. It seems to be a promising variety.

Hale's Early.—Medium to large, roundish, greenish white, nearly covered with red; flesh firm, good; clingstone; season middle of July. Tree vigorous and very productive. This is an old market sort, its greatest drawback is its tendency to rot at harvest time.

Matthew's Beauty.—Large, roundish, yellow; flesh thick, firm, rich, sweet; freestone; season middle to last of August. Tree vigorous and fairly productive. This variety follows Elberta and is a promising late sort.

McKinney.—Medium to large, yellowish with red cheek; flesh white, firm, juicy, sweet; clingstone; season middle to last of June. Tree a strong grower and fairly productive; a promising new variety.

Stump.—Medium to large, round with red cheek; flesh thick, firm, sweet, juicy; freestone; season first of August; tree strong, vigorous and productive. An old sort, but still one of the best white varieties in its season; a good keeper and shipper.

Ovido.—Small to medium, roundish oblong with prominent point at the end, greenish yellow with red cheek; flesh greenish white, tender, juicy and sweet; freestone. Tree a strong grower and very productive.

Sneed.—Medium, roundish oval, white with red cheek; flesh greenish white, juicy; clingstone; season last of May. Tree strong, vigorous and productive. The earliest peach yet produced.

Triumph.—Medium, yellow, nearly covered with red; flesh yellowish, tender, juicy, good; nearly free; season first to middle of June. Tree vigorous and productive; an excellent early peach and a good shipper.

Victoria.—Small to medium, nearly round, pale yellow; flesh pale yellow, sweet, juicy; freestone; season first of August. Tree a good grower and quite productive.

LIST OF VARIETIES FOR GENERAL PLANTING IN THE STATE.

As a short list including some of the best market sorts, we would suggest the following, given in the order of ripening: Sneed, Triumph, Carmen, Mammie Ross, Mountain Rose, Chinese Cling, Elberta, Stump, Matthew's Beauty. For a longer list for home use and local market take the above list and add to it Alexander, McKinney, Hale's Early, Early Crawford, Grey, Pallas, Tabor, Imperial. The last four varieties are suitable only for the southern half of the State and coast region.

Notes on the Blooming of Peaches.

Varieties.	March 4.	March 15	March 26.	April 1.	April 6.
Carmen	buds swelling.	buds opening.	full bloom.	blossoms falling.	....
Early Crawford	....	first blooms.	full bloom.	blossoms falling.	....
Grey	buds swelling.	first blooms.	full bloom.	blossoms falling.	....
Hale's Early	....	buds pink.	first blooms.	....	full bloom.
Marks	....	buds pink.	full bloom.	....	....
Matthew's Beauty	....	first blooms.	full bloom.	blossoms falling.	....
McKinney	....	buds pink.	first blooms.	full bloom.	blossoms falling.
Stump	....	first blooms.	full bloom.	blossoms falling.	....
Ovido	buds opening.	full bloom.	blossoms fall en.	....	....
Reeves	buds swelling.	first bloom.	full bloom.	blossoms falling.	....
Sneed	buds swollen	buds opening.	full bloom.	blossoms fallen.	....
Triumph	....	buds swollen.	blooming	full bloom.	blossoms fallen.
Victoria	....	blooming	blossoms fallen.	....	....

PLUMS.

The season has not been a very favorable one for plums. The varieties have fruited very unevenly. This is probably due to the excessive crop of 1900, which left the trees in poor condition. The hailstorm of May 13th did a considerable damage by the hailstones marking the surface of the fruit so as to give it a poor appearance. On account of the freedom from late frost this spring, we were able to get some fruit from the very early blossoming sorts. We give a table of notes on the blossoming period, and general condition of crop, and another tabulation showing the number of trees of each variety, that were set in 1896, the number of trees that have died from 1896 to the fall of 1901, and the number of trees alive at present, with a note as to their general condition.

During the present season a large number of trees have died from some unaccountable cause. For one to have a sucessful plum orchard, a setting of trees must be made every year. So that as fast as one orchard gives out another will be coming on to take its place. (For description of plums and varieties for planting see Bulletin No. 112.)

Notes on the Blooming of Plums 1901.

Varieties.	March 4.	March 9.	March 15.	March 26.	April 6.	April 11.	Condition of crop in 1901.
Abundance, Berger, Botan and Yellow Fleshed Botan.	....	buds showing white.	buds opening.	full bloom.	....	....	About one-half crop.
Burbank........	buds showing white.	buds opening.	full bloom..	fallen.	....	....	Very light.
Blood No. 4	buds opening.	nearly full bloom.	blossoms falling.	....	....	....	Good.
Berckman's	....	buds opening.	full bloom..	falling......	....	....	Light.
Chabot, Babcock, Bailey's Japan, Hattankio, Munson, or Yellow Japan.........	....	buds opening.	full bloom..	fallen.	....	....	Light.
Chas. Downing...	....	....	buds swelling.	buds opening.	nearly full bloom.	blossoms falling.	Full.
Emerson.........	buds opening.	full bloom.-	falling......	....	....	....	Full.

Notes on the Blooming of Plums 1901.—Cont'd.

Varieties.	March 4.	March 9.	March 15.	March 26.	April 6.	April 11.	Condition of crop in 1901.
Excelsior	....	buds opening.	full bloom..	fallen.	....	....	Very good.
Earliest of All ...	....	....	buds swelling.	buds opening.	full bloom..	....	Failure.
Golden Beauty...	....	....	buds swelling	buds opening.	blooming. ..	blossoms falling.	Very full.
Gold	....	buds opening.	blooming .	fallen.	....	....	Fair.
Hale	....	buds opening.	blooming ..	fallen..	....	....	Failure.
Hawkeye	....	....	....	....	buds swelling.	blooming. ..	Good.
Kelsey	buds opening.	blooming...	falling.	....	....	....	Light.
Kurr	....	buds white.	buds opening.	falling	....	....	Very good.
Lone Star	....	buds white.	full bloom..	fallen.	....	....	Failure.

Notes on the Blooming of Plums in 1901.—Cont'd.

Varieties.	March 4.	March 9.	March 15.	March 26.	April 6.	April 11.	Condition of crop in 1901.
Long Fruited	....	....	....	buds opening.	full bloom..	falling	Failure.
Maru	....	....	....	buds swelling.	buds opening	full bloom..	Failure.
Normand	....	buds opening.	blooming...	falling.....	....	....	Very full.
Milton	....	....	buds opening.	blooming...	full bloom..	....	Fair.
Orient	....	buds opening.	blooming...	falling	....	....	Tree died before ripening crop.
Pres. Wilder	....	....	buds opening.	blooming. ..	full bloom..	....	Light.
Red Nagate	....	....	buds opening.	blooming ..	blossoms falling.	....	Full.
Rockford	....	....	....	....	buds opening.	blooming. ..	Failure.
Satsuma	buds opening.	blooming...	blossoms falling.	....	....	....	Good.

Notes on the Blooming of Plums in 1901.—Cont'd.

Varieties	March 4.	March 9.	March 15.	March 26.	April 6	April 11.	Condition of crop in 1901.
Transparent		buds opening.	blooming	blossoms falling.			Very full.
Willard				buds opening.	blooming	blossoms falling.	Failure.
Wickson	buds opening.	blooming.	blossoms falling.				Light
Whitaker				buds opening.	blooming.	blossoms fallen.	Good.
Wayland			buds opening	blooming.	full bloom	blossoms fallen.	Failure.
Wooten			buds opening.	blooming	full bloom	blossoms falling.	Full.
Wild Goose			buds white.	buds opening	blooming	blossoms fallen.	Full.
Yosebe			buds white.	buds opening.	blooming	blossoms falling.	Light.

Notes on the General Condition of the Orchard.

Varieties. JAPANESE TYPE.	Trees set 1896.	Trees alive 1901.	Died from 1896 to 1901.	General condition of trees.
Abundance, Berger, Botan, Yellow Fleshed Botan..........	8	7	1	Strong, vigorous, good growth.
Berckmans.......	2	1	2	In good growing condition.
Burbank.........	4	2	2	Poor growth, trees dying.
Blood No. 3......	2	0	2	
Blood No. 4.....	2	2	0	Making a good growth.
Chabot, Babcock, Baily, Hattankio, Munson, Yellow Japan..........	11	4	7	The few trees left are in good condition.
Hale............	3	3	0	Very strong and vigorous.
Kelsey..........	2	1	1	Tree in fair condition.
Kerr............	3	2	1	Quite strong and vigorous.
Long Fruited.....	2	0	2	
Maru............	2	0	2	

Notes on the General Condition of the Orchard.—Cont'd.

Varieties.	Trees set 1896.	Trees alive 1901.	Died from 1896 to 1901.	General condition of trees.
Normand.........	2	2	0	Trees in good condition.
Orient............	2	0	2	
Red June. Red Nagate	5	3	2	Strong and healthy trees.
Satsuma..........	2	1	1	Last tree slowly dying.
Willard	2	0	2	
Yosebe....	1	1	0	In very good condition.
Totals.. ...	55	29	26	
AMERICAN TYPE.				
Hawkeye	2	0	2	
Rockford.... ...	2	1	1	Making a struggle to live.
Weaver..........	2	0	2	
Wyant.	2	0	2	
Totals......	8	1	7	
WILD GOOSE TYPE.				
Charles Downing.	2	1	1	Making good growth.

Notes on the General Condition of the Orchard.—Cont'd.

Varieties.	Trees set 1896.	Trees alive 1901.	Died from 1896 to 1901.	General condition of trees.
Milton..........	2	2	0	In good condition.
Miner...........	2	0	2	
President Wilder.	2	1	1	Making good, strong growth.
Whitaker........	2	1	1	Making fair growth.
Wild Goose.......	2	1	1	Growth very poor.
Wooten.....	2	2	0	Small growth.
Totals..	14	8	6	
WAYLAND TYPE.				
Golden Beauty...	2	2	0	Very strong and vigorous.
Wayland.........	2	1	1	Last tree nearly dead.
Totals..	4	3	1	
CHICASAW TYPE.				
Emerson.........	2	2	0	Making a steady growth.
Lone Star........	2	2	0	Only a fair growth.
Transparent	1	1	0	Vigorous growth.

Notes on the General Condition of the Orchard.—Cont'd.

Varieties.	Trees set 1896.	Trees alive 1901.	Died from 1896 to 1901.	General condition of trees.
Totals......	5	5	0	
HYBRID PLUMS				
Gold.....	2	2	0	Making good, strong growth.
Excelsior..... ...	2	2	0	Vigorous and strong.
Wickson	2	1	1	Making very poor growth.

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ALABAMA.

Agricultural Experiment Station

OF THE

AGRICULTURAL AND MECHANICAL COLLEGE,

AUBURN.

COWPEA CULTURE.

By J. F. DUGGAR.

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1902.

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The Bulletins of this Station will be sent free to any citizen of the State on application to the Agricultural Experiment Station, Auburn, Alabama.

COWPEA CULTURE.

By J. F. Duggar.

Summary.

Cowpeas may be planted in May, June or July. For the production of seed, planting in June has been most satisfactory.

By planting New Era cowpeas April 26, two crops were matured before frost.

Early planting lengthens the period of growth and increases the tendency for the plants to form runners.

Weevil in cowpea seed should be destroyed by the use of carbon bi-sulphide.

Subsoiling and liming failed to increase the yield.

In one test broadcast sowing afforded a larger yield of hay than did drilling and cultivation, but the latter method is more certain to afford a fair crop of peas in an unfavorable season.

A large number of varieties have been tested, both as to yield of seed and of hay. Those averaging the largest production of grain are New Era, Black and Red Ripper. The varieties making the largest average yields of hay for three years are Wonderful and Clay. Wonderful, or Unknown, is a standard general purpose cowpea for the central and southern parts of the State.

The number of seed in a bushel varied from 94,634 with the Taylor variety, to more than 236,000 with New Era and Small Black.

The number of pounds of dry unhulled peas required to shell a bushel of 60 pounds varied between 78 pounds

with Brown-eye Crowder and 90 pounds with Wonderful.

Fertilizer experiments at Auburn on soil repeatedly fertilized showed very slight gains from any fertilizer, but on poor sandy or loamy soils an application of acid phosphate, with or without potash, is recommended. In three tests acid phosphate proved superior to crude or raw phosphate.

In composition cowpea hay resembles wheat bran, and the seed are much richer in nitrogen, or muscle-forming material, than either wheat bran or corn. By the use of a good quality of peavine hay the usual corn ration of working teams can be greatly reduced.

As compared with the velvet bean as a forage plant, cowpeas have the advantage in convenience of curing and in palatability, but are at a disadvantage on certain soils by reason of the susceptibility of cowpeas to the attacks of the nematode worm and of several fungous diseases. Velvet beans and beggar weed were found to be exempt from injury from nematodes.

At Auburn the yield of forage has averaged higher from cowpeas than from velvet beans, soy beans or beggar weed.

There is great need for a suitable grass to grow with cowpeas to aid in retaining the cowpea leaves during curing and to hasten the curing process. A volunteer growth of crab grass often serves this purpose. German millet has been found fairly satisfactory for sowing with the early varieties, but it matures too early for use with medium and late varieties.

Sorghum sown with cowpeas increased the yield of hay, but did not make curing easier.

The most profitable method of disposing of the growth of cowpeas consists in cutting the vines for hay and using the roots as fertilizer for the next crop.

Where haying is not practicable and picking too expensive except for seed, the vines should be grazed while the leaves are still retained.

Cows pastured on corn stalks and drilled cowpeas between the corn rows afforded butter and increased live weight worth in 1900 $4.47 per acre grazed over; the next year the returns in butter alone from cowpeas drilled between the corn rows was $5.28 per acre.

As an economical method of harvesting the grain of cowpeas the use of a scythe or reaper is practicable for the bunch varieties, the entire mass being thoroughly cured.

In curing peavine hay no rule as to the number of hours of exposure in swath, in window, or in cocks can be blindly followed, as the method must vary with the luxuriance and succulence of the vines and the condition of the weather. The aim should be to retain all the leaves, which requires that the exposure of the unraked hay be as short as practicable and that part of the curing be effected while the partially cured material is in windrows or cocks.

Hay caps make haying with cowpeas less risky, and when they are repeatedly used in curing hay from a succession of plantings, they soon repay their first cost.

With different varieties from 51 to 75 per cent. of the weight of the entire plant was obtained in the hay, the remainder being in roots, stubble, and fallen leaves.

The leaves averaged 30 per cent. of the weight of the hay.

Analyses made of leaves, pods and blooms, fine stems, coarse stems, fallen leaves, roots and stubble, showed that the leaves were at least twice as rich in protein (or muscle-forming material) as the other portions of the plant.

Introduction.

This bulletin gives the results of experiments made at Auburn during the past six years. The experiments have been planned and directed by the writer and all the weighings and supervision of labor have been in charge of Mr. T. U. Culver.

Our work with cowpeas is divisible into two parts, that which relates to their cultivation and use as forage plants and that which takes note of their value as fertilizers or soil improving plants. This bulletin treats only of the first division of the subject. Our next bulletin will record results showing the fertilizing value of cowpeas and the best methods of disposing of this plant when the improvement of the soil is the principal aim.

The cowpea is highly appreciated by the best farmers in every southern state, yet several times as many acres as at present might be devoted to it with advantage.

An enormous increase in the acreage of cowpeas would do more, we think, than any other immediately practicable reform to cure the ills of southern farming, to enrich the soil, to raise the acreage yield of all other crops, to build up the live stock industries, and to promote diversified farming.

Time for Planting Cowpeas.

The cowpea is very tender as regards cold. It is strictly a hot weather plant and the seed should not be planted until the soil is quite warm. It can be planted as early as the beginning of the cotton planting season. But such early planting is unwise in itself as well as in conflict with other work that is imperative in April.

Usually nothing is gained by planting before the first of May, and our largest yields of seed have been obtained by planting after the first of June. It should be noted that in the variety test of 1901, where most of the plots afforded more than 20 bushels of seed per acre, planting did not occur until June 28.

Rather late planting tends to promote seed production and to reduce the growth of vine. Early planting promotes a luxuriant growth of vines, with consequent increased tendency for the vines to run and tangle. and often results in a decreased yield of seed.

Whippoorwill peas planted in drills, April 19, 1898, and cultivated. did not ripen seed until the latter part of summer, and a period of 160 days elapsed between the dates of planting and picking, though properly the harvesting should have taken place several weeks earlier. This was in a year when the rainfall was deficient up to July, and abundant after the first week in July.

Compare this with the Whippoorwill variety planted July 1, 1896, in drills in the special phosphate test. Here all the pods were ripe 87 days after planting.

Notice also that, in 1900, in the fertilizer experiment, only 99 days elapsed between the planting and picking of the Whipporwill cowpeas.

Likewise Whipporwill peas planted June 28, 1901, were picked almost clean 102 days after the date of planting.

These and other examples which we might cite indicate that by planting cowpeas rather late we greatly shorten the period of growth.

Even when it is desired to grow two crops of cowpeas the same year it is not necessary to plant many days before May 1. In 1901 we grew two crops of New Era cowpeas to full maturity, the second crop being from pods ripening in midsumer.

The seed planted April 26 matured a crop which was picked July 22 and planted July 26.

This planting in turn afforded a crop (of mature pods) before frost, about 90 per cent. of the pods being ripe on November 1.

The New Era is the only one among the varieties tested here, from which we have endeavored to obtain two crops in one year. Such a course is probably advisable only where cowpeas for planting are scarce and costly.

The middle of July is probably the latest date of planting with the expectation of getting a large yield, and with most varieties planting in June seems preferable at Auburn.

To destroy the weevil that becomes so destructive in stored cowpeas on the approach of warm weather, we use carbon bisulphate, which is also needed as a means of destroying the weevil in corn. The cost is 10 to 20 cents per pound, and one pound will treat a number of bushels of shelled cowpeas. About an ounce of the liquid is poured into an open can and placed upon the upper surface of the peas in a box or barrel and a cloth spread over all. The treatment may be repeated after a few days. The liquid evaporates rapidly, and the vapor of carbon bi-sulphide destroys insect life. The vapor is highly inflammable and no flames or lighted pipe should be allowed near until the odor has disappeared.

Preparation and Planting.

The place in the rotation usually assigned to cowpeas is that of a partial crop planted between the corn rows at the last or next to last cultivation, or else that of a second crop on the land where oats, wheat, or rye has been harvested.

It is not putting the matter too strongly to say that 80 per cent. of the acreage of corn in this State should have cowpeas between the rows and that at least 80 per cent. of the area from which small grain is cut in May and June should be planted in cowpeas.

On sandy upland where the corn rows are five feet apart we prefer to plant the cowpeas in a single drill half way between the lines of corn and to plant at the next to the last cultivation, so that the last cultivation serves also to give the cowpeas a start. On good bottom land, well supplied with moisture, we prefer to cow cowpeas broadcast in corn, and this, of course, can be done only at the time of the last cultivation.

On rich land care should be taken that the sowing of cowpeas, especially of the running varieties, does not take place so early that the corn will be overrun by the vines. Avoidance of this trouble lies either in late planting or in the use of the bunch varieties.

In drilling cowpeas between the corn rows we obtain a more uniform start by employing the planter than by dropping the seed by hand in the first or center scrape furrow and covering with the two siding furrows of the scrape run next to the corn.

We have employed numerous methods of planting cowpeas after small grain. Since work is pressing at this season and the soil sufficiently moist for plowing only for relatively brief periods, our usual policy is to plant the seed without waiting to make thorough preparation.

There is room for considerable ingenuity in determining the best method of completing the preparation and giving the first cultivation. One of the most important aims to be kept in view in this is to keep the land nearly level so that the plants may better resist drought and so that a mower may be conveniently used. After the first cultivation, when this serves also as a partial breaking, only the heel scrape or other shallow-working implement should be used.

Though drilled cowpeas on the Experiment Station farm when growing alone are usually hoed once, yet we are inclined to think this is often an avoidable and unprofitable operation.

With cowpeas intended for hay, pasturage or fertilizer, it is, of course, even less necessary than where the prime object is the production of seed.

Possibly the weeder, which we have successfully used on other crops, and which others have run over cowpeas without injury, may prove a partial substitute for the hoe. It should be employed when grass and weeds are extremely small.

We have made no test to ascertain the best amount of seed, which will doubtless vary somewhat with different varieties. The usual amount is one to one and one-half bushel when sown broadcast and about half a bushel per acre when planting is in drills far enough apart to permit cultivation.

The grain drill, with all tubes open or with part of them stopped, is sometimes used in planting cowpeas.

Subsoiling.

Two tests of the effect of subsoiling for cowpeas have been made on reddish loam soil, in the same field as that used for similar experiments with corn and cotton. In both cases the variety Wonderful was employed. The peas were in drills and were cultivated several times.

In 1897 cowpeas were planted on a plot that had been imperfectly subsoiled in February, 1896, by using a scooter run to a depth of four inches in the bottom of the furrow made by a one-horse turn plow. This operation was not repeated in 1897.

On both the plot thus treated and on that which had never been subsoiled the crop was exceedingly poor. The plot once subsoiled yielded at the rate of 6.7 bushels per acre and that not subsoiled 5.6 bushels.

In May, 1898, cowpeas were planted on a plot which had been subsoiled as above in the preceding February. The yield of hay was 5,120 pounds on the subsoiled plot and only 40 pounds less on the plot never subsoiled. A different result might have resulted from thorough work with a subsoil plow.

Drilling Versus Sowing Broadcast.

May 12, 1898, Wonderful cowpeas were sown broadcast at the rate of 60 pounds per acre and plowed in with one-horse turn plows. On the same date an equal quantity of seed was planted in drills, which was done by dropping the seed by hand in every third turn plow furrow, the nex t furrow-slice serving as a covering.

On all plots the fertilizer, phosphate and muriate of potash, was applied broadcast on the plowed surface and harrowed in.

The vines were cut September 13. After curing for a week, most of this time in cocks, the weights of hay were found to be as follows:

Pounds of cowpea hay per acre from drilling versus broadcast sowing.

Plot No.		Hay per acre. Lbs.
4	Broadcast	6,400
7	Broadcast	6,400
5	Drilled	5,600

In this test broadcast sowing afforded 800 pounds of hay per acre more than drilling. The large yields indicate that the season was favorable and the rainfall records show that a large amount of rain fell in July and August.

The drilled peas were cultivated twice with scrapes, the total number of furrows per row being three.

In addition to experimental plots we plant every year considerable areas of cowpeas, both broadcast and in drills. In deciding on the best method of planting in this "general crop" we are governed by the price and available supply of seed and labor. We use four to six pecks of seed sown broadcast and two or three pecks in drills. In sowing broadcast we seldom plow in the seed, as in the above-described experment, but sow them on the plowed land and cover seed and fertilizer with disc harrow or with one-horse cultivator.

In planting in drills we open the drills in plowed or unplowed ground, and are careful either to apply the fertilizer in the covering furrow or else to mix it with the soil before the seed are dropped.

Where the ground has been plowed, the combined grain drill and fertilizer distributor would doubtless be satisfactory, stopping most of the tubes if it is desired to drill the seed in rows wide enough for cultivation.

Our observations lead to the belief that in unfavorable seasons drilling and cultivation gives the largest yield of hay (and always of seed) and that in seasons of abundance of rainfall broadcast planting affords the greater amount of hay, but not of seed.

Varieties.

During each of the past six years one or more tests of varieties of cowpeas have been undertaken. Some of these tests have been vitiated by agencies that need not be stated here, and only those are here reported which have been free from inequalities and errors.

Varieties of cowpeas have been tested both with reference to the yield of seed and to the yield of hay. The variety Whippoorwill (a speckled bunch pea) has competed in all these tests and its yield has been taken as a basis by which the yield of any other variety may be conveniently stated. Thus, taking the yield of grain from Whipporwill in 1897 as 100, that of Wonderful for the same year is 106, or 6 per cent. greater.

The grain yield of varieties of cowpeas.—The following table gives the results of four tests of varieties on the basis of seed production, all varieties planted in drills and cultivated. In all cases a bushel of shelled peas is assumed to weigh 60 pounds.

Yields of grain of varieties of cowpeas.

VARIETY.	Yield per acre in				Relative yield taking Whipporwill yield as 100 per cent.				
	'97	'98	'00	'01	'97	'98	'00	'01	Av.
	Bus.	Bus.	Bus.	Bus	%	%	%	%	%
Clay	....	7.6	....	14.0	....	50	....	63	58
Crowder, Brown-eye	....	....	....	19.3	....	....	....	87	....
Crowder, Large White	....	17.5	....	....	....	116	....	....	....
Crowder, Yellow	....	....	....	23.3	....	....	....	105	....
Brown-eye, White	....	2.5	....	....	....	17	....	....	....
Black, from Wood	....	21.0	....	21.2	....	140	....	96	118
Black, from Ala. Ex. St.	....	9.6	....	....	....	64	....	....	....
Black, from Hastings	....	....	7.8	....	....	....	52	....	....
Black, Large Early, from Packard	....	19.5	....	....	....	130	....	....	....
Black-eye Large (Wood)	....	15.0	....	19.0	....	100	....	86	92
Black-eye, Large White from Willett	....	9.0	....	....	....	60	....	....	....
Black-eve, Extra Early	....	16.2	....	16.6	....	108	....	75	92
Early Brown Dent	....	23.4	....	....	....	156	....	....	....
Early Bullock	....	21.8	....	....	....	145	....	....	....
Iron	....	14.9	....	....	....	99	....	....	....
Jones White	....	8.0	....	....	....	53	....	....	....
Lady	....	8.9	....	....	....	59	....	....	....
Lealand	....	17.5	....	....	....	116	....	....	....
Miller	....	8.2	....	....	....	54	....	....	....
Mush	....	17.6	....	....	....	117	....	....	....
New Era	....	22.0	....	22.0	....	146	....	104	125
Ross White	....	11.9	....	....	....	79	....	....	....
Red Ripper	....	18.5	....	20.1	....	123	....	91	107
Taylor	....	....	....	23.6	....	....	....	107	....
White Giant	....	....	10.8	15.9	....	....	75	72	74
Unknown	8.3	....	....	....	106	....	....	....	....
Wonderful	7.4	15.2	....	21.6	94	101	....	98	98
Whippoorwill	7.8	15.0	14.4	22.0	100	100	100	100	100

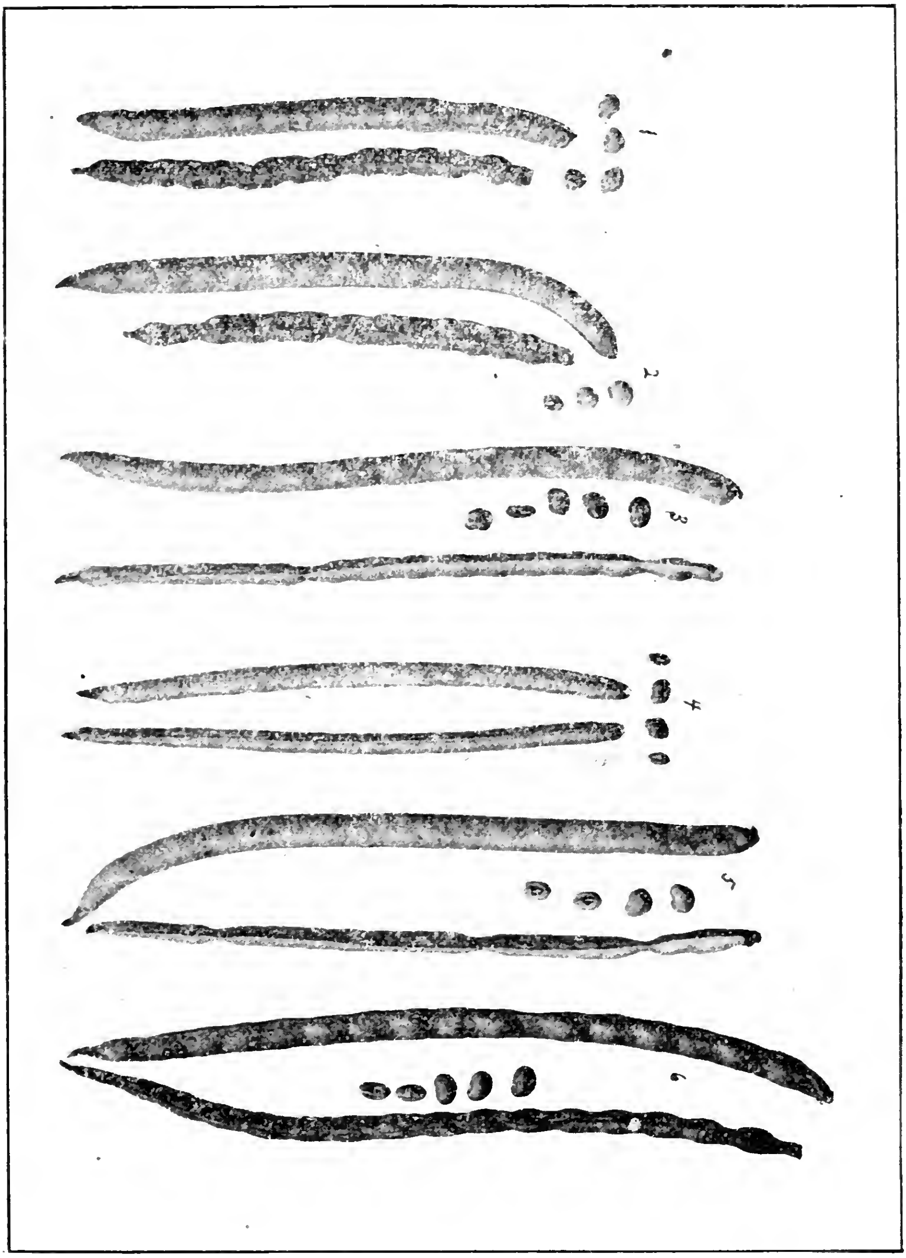
Varieties averaging large yields of seed have been New Era, Black (from Wood), and Red Ripper. Wonderful wants only 2 per cent. of equalling the average yield of Whippoorwill.

Varieties making large yields, but which have been tested only once, are Early Brown Dent, Early Bullock, Large Early Black (from Packard), Lealand, and Large White Crowder.

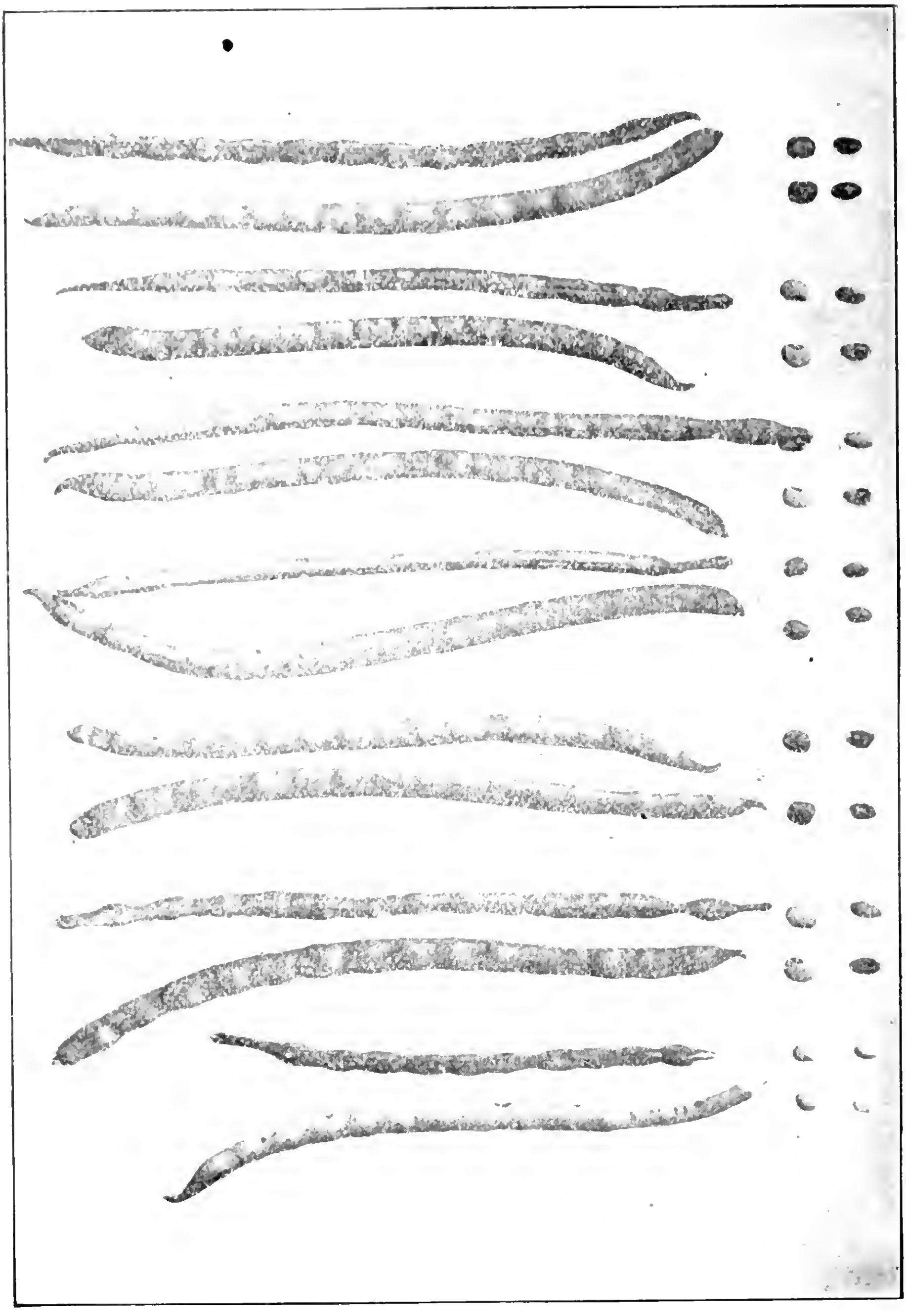
Additional tests must be made before conclusions can be drawn as to the relative values of these varieties for seed production. There is need for a variety of cowpeas that in addition to the good qualities of Whipporwill, prolificacy, upright growth, and earliness, shall be more resistant to mildew or rotting of the pods than is this standard kind. The writer will be glad to test any local varieties for which this quality is claimed.

Size of seed.—The following table gives the weight of 100 cowpeas of the varieties grown in 1901, and also the calculated number of seed in a bushel of 60 pounds:

VARIETY.	Wgt. of 100 seed	No. of seed in 1 bush. (60 lbs.)
Taylor	28.72	94,634
White Giant.	25.45	106,797
Brown-eye Crowder	24.74	109,858
Yellow Sugar Crowder	23.16	117,314
Black	22.07	123,153
Red Ripper	20.89	130,110
Extra Early Black-eye	20.74	131,051
Large Black-eye	20.04	135,638
Whippoorwill	17.98	150,621
Wonderful	18.86	144,117
Clay	17.86	151,629
Jones' Perfection White	13.97	194,560
New Era	11.49	236,545
Small Black	11.30	240,531



1. Yellow Sugar Crowder.	4. New Era.
2. Brown-eye Crowder.	5. Wonderful.
3. Whippoorwill.	6. Taylor.



9. Black, from Wood.
10. Large, Black-eye.
11. Ex. Early Black-eye.
12. Clay.
14. Red Ripper.
15. White Giant
16. Jones White.

Taylor had the largest seed, of which only 94,634 were required to make a bushel. New Era has the smallest seed of any kind in the variety test, having 236,545 seed in a bushel. In rows three feet apart, and three seed per foot of drill, an acre would require about 11 pounds of New Era or about 28 pounds of Taylor seed.

Small Black, grown in another field, had seed slightly smaller than those of New Era.

Where to Get Seed.

The Station cannot undertake to supply seed. The addresses of the parties from whom this Station has obtained seed, as given below, will enable intending buyers, who cannot get seed nearer home, to correspond with seedsmen or growers.

New Era, from J. C. Little, Louisville, Ga.

Numerious varieties from H. P. Jones, Herndon, Ga.; Alexander Seed Co., Augusta, Ga.; Willett Seed Co., Augusta, Ga.; Mark W. Johnson Seed Co., Atlanta, Ga.; Curry-Arrington Seed Co., Rome, Ga.; H. C. Hastings, Atlanta, Ga.; E. G. Packard, Dover, Del.; and T. W. Wood & Sons, Richmond, Va.

The hay yield of varieties of cowpeas.—These tests were all made on poor sandy upland, though the land used for this experiment in 1897 was richer than that occupied by this test in the other years. In 1897 the seed was sown broadcast; in 1898 and 1899 the seed was planted in drills about 2½ feet apart. The yields are lower than we usually obtain in our fields sown for hay, which may be partly due to the fact that the peas in the experiments were sown late,—the last week in June,—and that the product was weighed only after the hay had become extremely dry.

Yields of hay of varieties of cowpea.

VARIETY.	Yield per Acre in '97 lbs.	'98 lbs.	'99 lbs.	Relative yield, Whipprowill — 100 per cent. '97 %	'98 %	'99 %	Av. %
Black-eye, Extra Early	....	....	1416	....	....	79	....
Black-eye, Large	....	....	....	....	....	....	....
Black	2220	2880	1618	89	105	83	92
Black, Large Early	....	....	1383	....	....	68	....
Clay	3975	3373	1209	160	121	59	113
Crowder	....	....	1308	....	....	64	....
Crowder, Large White	....	1280	2034	....	47	100	73
Iron	....	4080	2154	....	150	106	128
Lady	....	....	1401	....	....	69	....
Lealand	....	....	2206	....	....	119	....
Miller	....	....	1623	....	....	79	....
Mush	....	....	1929	....	....	95	....
New Era	....	....	2310	....	....	113	....
Ross White	....	....	2430	....	....	119	....
Red Ripper		3720	....	....	136	....	....
Whippoorwill	2485	2720	2030	100	100	100	100
Wonderful	3700	4160	1569	148	153	77	126

The largest average for three years was made by the Wonderful (or Unknown) variety, followed by Clay. Iron, which was tested only two years, surpassed all other varieties in the average yield for those two years.

The ease of harvesting varies greatly with different varieties, the running kinds affording the greatest difficulty.

The quality of the hay differs somewhat with different varieties. For example, Wonderful has larger stems than any other variety tested and hence its hay appears coarser.

Nevertheless, the large yield and erect stem make this a very popular variety for hay. It is too late to mature seed in a high latitude or when planted very late in summer.

On the whole, as a general purpose cowpea, suitable for either grain, forage, or fertilizer, we may safely plant the Wonderful or Unknown in the central and southern parts of the state until some other variety is proved to be superior. Perhaps an exception should be made of the Central Prairie Region where there is complaint that there is an extreme tendency for cowpeas to run to vine and fail to fruit properly. It is suggested that the early bunch varieties, especially New Era, planted late in June, be tried on these soils; also that when seed are desired from medium and late varieties, that they be planted early and thick in the drill.

Proportion of seed and hulls in unshelled cowpeas. The following table gives the number of pounds of seed in 100 pounds of unshelled cowpeas. In all cases the peas were not beaten out until at least several weeks after the date of picking, thus giving time for thorough drying.

Pounds seed in one hundred pounds of unshelled cowpeas.

	Yrs.	Lbs.		Yrs.	Lbs.
Brown-eye, White	1	70	Early Brown Dent.....	1	77
Black, from Wood	2	76	Early Bullock	1	82
Black, from Ala. Ex. Sta	3	69	Iron	3	69
Black, Large Early, from			Jones, White	2	69
Packard	1	76	Lady	3	74
Black-eye, Large, from			Lealand	3	77
Wood	2	77	Miller	1	77
from Willett	3	73	Mush	1	83
Black-eye, Large White,			New Era	2	73
Black-eye, Extra Early,			Ross White	1	69
Black-eye, Extra Early,			Red Ripper	4	71
from Wood	2	76	Taylor	1	77
Clay	4	67	White Giant	2	71
Crowder	3	75	Unknown	2	67
Crowder, Brown-eye	1	85	Wonderful	4	70
Crowder, Yellow Sugar.	1	84	Whippoorwill	4	73
Crowder, Large White ..	1	83			

The proportion of seed and hulls varies according to the variety. In our tests it is highest with the several Crowder varieties, and lowest with Wonderful and Clay; number of pounds of thoroughly dry unhulled peas in the pod required to make a bushel (60 pounds) of shelled peas was only 78 pounds with Brown Eye Crowder and 90 pounds with Wonderful. To get corresponding figures for any other variety the reader can divide 6,000 by the figure opposite each variety. It should be stated here that the percentage of grain in the same variety varied greatly in different years.

Effects of Lime on Cowpeas.

Two tests were made on this point, using drilled cowpeas of the variety Wonderful, fertilized with acid phosphate and cultivated several times.

In 1897, on reddish loam soil, and stiffer than that in the later tests, the yield was 5.6 bushels of peas without lime and only 5.2 bushels where slaked lime at the rate of 640 pounds per acre had been applied broadcast in February of the preceding year. Whatever lime remained in the soil was evidently of no benefit of cowpeas.

In March, 1898, water slaked lime was used as a top dressing on oats on gray sandy soil. It was used at the rate of 1,000 pounds per acre of the unslaked lime, which is equivalent to a much larger weight of the slaked material.

After the oats were cut the land was plowed and cowpeas drilled in and cultivated as necessary. The yield follows:

Plot not limed, 13 bushels cowpeas per acre.

Limed plot, 10.2 bushels cowpeas per acre.

Clearly lime was of no benefit, but apparently injurious as regards seed formation. There was no notable difference in the appearance of the vines.

Fertilizer Experiment.

This test was made in 1898 with Whipporwill cowpeas on gray or white sandy soil on a hilltop. Two cultivations were given, requiring altogether three furrows per row. The results follow:

Results of fertilizer experiment with cowpeas in 1898.

Plot No.		Fertilizer. Per acre.	Fertilizer. Kind.	Yield of seed per acre.
		Lbs.		*Bus.*
	1	240	Acid phosphate	13.9
	2	51	Muriate of potash	15.9
	3	00	No fertilizer	16.
	4	240 51	Acid phosphate Muriate of potash	15.4
	5	240 51 80	Acid phosphate Muriate of potash Nitrate of soda	19.1
	6	240 51	Acid phosphate Muriate of potash	16.7
	7	240	Acid phosphate	15.2
	8	00	No fertilizer	14.3
	9	240 51	Acid phosphate Muriate of potash	14.9
	10	51	Muriate of potash	15.1
Av.	3 & 8	00	No fertilizer	15.1
Av.	1 & 7	240	Acid phosphate	14.1
Av.	2 & 10	51	Muriate of potash	14.5
Av.	4. 6 & 9	......	Phosphate and muriate	15.3

Apparently none of the mineral fertilizers was decidedly advantageous, though with the complete fertilizer there was an increase of four bushels per acre. The failure of acid phosphate and muriate of potash to increase the yield is surprising, and the only explanation we can suggest is the fact that both phosphate and potash salts had been liberally used on this field during each of the preceding five years, and probably these materials had been applied annually for about fifteen years. This view implies that even on this gray light sandy soil, containing some flint stones, and underlaid by a rather stiffer sandy sub-soil, acid phosphate and potash are not wholly used up or lost during the year when they are applied but exert a considerably residual or cumulative effect.

Is Nitrogen Advantageous in a Fertilizer for Cowpeas?

Cowpeas are able to grow on poorer soil than is cotton or corn. This is because the cowpea plant, through the agency of the specific enlargements or tubercles or nodules on its roots, is able to draw a part of its nitrogen from the air, while corn, cotton, grasses, etc., are entirely dependent for their nitrogen on the soil and fertilizer.

Since the cowpea plant possesses this source of supply it is reasonable to assume that nitrogen can be omitted from its fertilizer, thus reducing the cost of fertilization. On the other hand it has been stated that during the early period in the life of this plant the tubercles afford no nitrogen, and that nitrogenous fertilizers are beneficial during this early period. One writer has recorded as his observation that cotton seed meal is a suitable fertilizer for cowpeas.

To put this latter statement to a test, four plots of drilled cowpeas in 1898 were employed. All were fertilized with 240 pounds of acid phosphate and 48 pounds of muriate of potash per acre. Two plots received in addition cotton seed meal at the rate of 100 pounds per acre. The cured hay averaged practically 2½ tons per acre, the plots with cotton seed meal affording only 40 pounds of hay per acre in excess of the others. There was a practical equality in yield, and a failure of cotton seed meal to exert any appreciable effect.

This is in accord with nearly all of the published fertilizer experiments with cowpeas.

We have found the tubercles on cowpeas when the plants were only a few inches high and a few weeks old. Apparently the nitrogen in the seed and that which even a poor soil yields is usually sufficient for the little plants up to the time when the root tubercles begin to exercise their function of supplying nitrogen.

The fertilizer test detailed in a preceding paragraph shows that with a complete fertilizer the yield of peas was 3.8 bushels per acre greater than where only phosphate and potash were used together.

This increase seems to be attributable to the use of 80 pounds of nitrate of soda.

The majority of experiments agree with the one where cotton seed meal was used in indicting that nitrogen is not a profitable constituent of the fertilizer for cowpeas.

Forms of Phosphate for Cowpeas.

A test was made in 1896 of acid phosphate, crude Florida soft phosphate, and a moistened mixture of these two, which mixture should have produced reverted phosphate. The crop was a failure, probably because of injuries to the roots by nematode worms, and there were only slight differences in the yields of seed on the plots differently fertilized. This was on very poor white sandy soil.

In 1898, co-operative tests of acid phosphate in comparison with equal weights of Florida soft phosphate (crude) were made for this Station by Mr. A. A. McGregor, on a loam soil with clay sub-soil, at Town Creek, Ala., and by Mr. J. P. Slaton, on sandy soil between Notasulga and Tuskegee. Apparently the soil at Town Creek was rich in lime, the other poor in lime.

Unfortunately there was a failure to pick the peas in both the tests, but the notes made by both of the experimenters have no doubt as to the superiority of acid phosphate over insoluble phosphate as a fertilizer for cowpeas. At Town Creek, where pods did not mature, the vines made the best growth where acid phosphate was applied; no difference could be detected between the growth of the unfertilized plot and that on the plot where Florida soft phosphate was employed.

On the sandy soil near Notasulga "the plot fertilized with acid phosphate seemed to me one-third better" than the one with the raw phosphate. These observations as to the superiority of acid phosphate agree with the results of experiments made at the Georgia Experiment Station and with a test made at Auburn in 1898, the results in our test being as follows:

	Bus. seed per acre.
Cowpeas, with no phosphate	9.4
Cowpeas, with 240 lbs. Florida soft phosphate	13.9
Cowpeas, with 240 lbs. acid phosphate	15.2

Apparently the raw or Florida soft phosphate was beneficial, and the acid phosphate still more so, the increase with the latter being 5.8 bushels of seed per acre, which gives a fair profit after deducting the cost of the 240 pounds of acid phosphate used on an acre.

Fertilizing cowpeas between corn rows.—In 1900 on one plot only half of the acid phosphate was applied to corn, the remainder (120 pounds per acre) being reserved and drilled with Whippoorwill cowpeas July 7. There was practically a failure of both the corn and cowpeas on this series of plots, so that the products of the several plots were not harvested separately. However, so far as could be judged by the eye, there was never any difference in the growth of the vines directly fertilized with phosphate and those which must have drawn some of their phosphate from the fertilizer that was applied to the corn some months before.

Nutritive Value of Cowpeas and Cowpea Vines.

The high nutritive value of the seed, the hay, and the green vines of the cowpea plant may be seen from the following figures adapted from Prof. W. A. Henry's book on "Feeds and Feeding:"

	Lbs. digestible.		
	Muscle formers	Starch, etc.	Fats
100 lbs. cowpeas (shelled seed) contain*..	17.3	63.1	.7
100 lbs. cowpea hay contain	10.8	38.6	1.1
100 lbs. green cowpea vines contain	1.8	8.7	.2

*Assuming same digestibility as for meal from Canada field peas.

Cowpea hay contains almost exactly the same amounts and proportions of digestible materials as wheat bran. The seed is more nutritious than wheat bran and far richer in protein,—the so-called "muscle formers,"—than is corn. In our feeding experiments with pigs it has proved itself better than corn when constituting only a portion of the grain ration. By feeding farm teams on a liberal allowance of peavine hay the amount of corn necessary can be reduced much below that usually consumed.

Cowpeas versus velvet beans as forage.—This comparison can be made on the basis of (1) palatability and nutritive value, (2) cost of growing and harvesting a ton of each, (3) productiveness, and (4) hardiness.

The number of analyses of velvet bean hay is insufficient to give an accurate determination of its exact nutritive value, in which, however, it is probably about equal to peavine hay. In palatability the advantage is decidedly with peavines.

We have found it practically impossible to use the mower in cutting velvet beans and when both crops are cut with the scythe our records show that the velvet beans require more labor than cowpeas. Indeed we have not yet found a thoroughly practicable and economical means of cutting and handling velvet bean vines.

In regard to the yields of hay from the two plants, when grown side by side, the following are the results thus far at Auburn, the variety of cowpeas employed being the Wonderful or Unknown.

	Cowpea hay	Velvet bean hay.
Drilled crop, 1897, lbs. hay per acre	2420	3872
Drilled crop, 1897, lbs. hay per acre	8930	7300
Broadcast crop, 1898, lbs. hay per acre..........	4160	4480*
Broadcast crop, 1898, lbs. hay per acre	4160	2880†
Broadcast crop, 1898, lbs. hay per acre....	6400	5360

*128 lbs. velvet beans sown broadcast per acre; †64 lbs. velvet beans sown broadcast per acre.

On the score of productiveness our experiments are slightly in favor of cowpeas, though on other soils this result might be reversed.

As to the relative hardiness of the two plants, the velvet bean is undoubtedly superior. It suffers less from the attacks of leaf eating insects, and, though the young plants of the velvet bean are not exempt from the attacks of a fungous root rot, characterized by whitish to brownish, small, spherical, sclerotia on the stem near the surface of the ground, yet the velvet beans are much more resistant to it than are cowpeas, which in some parts of the Station farm are almost ruined by this disease. For example, in 1899, on adjoining plots, cowpeas were ruined by September 12, at least half the plants having died prematurely, the yield of seed being reduced to less than two bushels per acre, while velvet beans were perfectly healthy and extremely luxuriant.

Still more important as regards the relative hardiness of the two plants is their susceptibility to injury from the attacks of the microscopic nematode worms that infest the soil, especially in gardens and orchards, in parts of the Gulf States. These worms enter the roots of many plants, cowpeas, cotton, peaches and numerous vegetables, causing swellings, which, as they become larger, result in depriving the infected root of its function of supplying water and food to the plant.

It is important for farmers to distinguish these nematode injuries from the beneficial tubercles naturally present.

Speaking generally and disregarding the advanced or corky stage of the nematode swelling, tubercles and nematode bumps may be distinguished by their position. The beneficial tubercles are located outside of the outer surface of the root, and to the side of the same; the injurious enlargements are usually spindle shaped and their position is such that the root seem to be growing through the center of the swelling. In other words, the root is enlarged symmetrically on all sides in the early stages of nematode injuries.

Cowpeas are very susceptible to injuries from nematodes. Velvet beans are highly resistant to such attacks, if not entirely exempt from them. We have been able to find no plain indications of nematode injuries on the roots of velvet beans.

This is a matter of much importance, especially when a choice must be made between these two legumes for growing in old garden spots, which are likely to be infested with nematodes, or with a fungus root disease.

In this connection it should be said that Orton and Webber, of the United States Department of Agriculture, found the Iron variety of cowpeas to be resistant both to nematode attacks and to cowpea wilt, the latter being a fungus disease different from the one that is most destructive at Auburn.

The remedy for all these troubles consists in practicing such a rotation as will keep susceptible plants off of the infested or infected fields for at least a few years.

In brief, the cowpea as a forage plant is superior to the velvet bean in palatability and ease of curing and only inferior in hardiness or resistance towards the attacks of certain insects and fungous diseases.

Cowpeas versus beggar weed and soja beans as forage. At Auburn the yield of cowpea hay has greatly exceeded that of beggar weed hay and has been superior in quality. The advantages in favor of beggar weed are its greater ease of curing, resulting from its more erect growth, and its practical or complete exemption from nematode injury. Beggar weed also seems resistant to the fungus root rot.

Compared with soja or soy beans, cowpeas at Auburn have averaged a heavier yield of hay and have been surpassed only in the greater ease with which the soy bean, on account of its erect growth, can be harvested. The cowpea has been able to make a fair growth on land too poor for soy beans.

Cowpeas in Various Mixtures for Hay.

The leaflets easily drop from the vines in curing unless special care is exercised. This loss can be avoided and the curing process facilitated by growing the peavines in combination with some grass that cures readily and which serves with its blades and fine stems to tie the whole mass together so that the leaflets of the legume are not lost. For this purpose crabgrass is one of the best, and the only disadvantage is that as a volunteer growth must be relied on, there is some uncertainty as to the stand and as to the grass growing to sufficient height on the poorer spots.

We have found German millet useful in this respect. for fair and good soils. This grass makes it necessary to choose an early variety of cowpeas to sow it with, else the millet will be ready for the mower while the peas are entirely too immature. Whipporwill cowpeas and German millet make a fairly satisfactory combination, and the qualities of the New Era lead us to the hope that it will make a still more desirable combination with German millet. The usual quantity of millet seed is one peck, with a bushel of peas, per acre.

Possibly the later varieties might also be suitable for sowing with German millet, if the seed of the latter could be put in the ground a few weeks after the peas had germinated.

In one case we tried this, drilling a row of millet within six inches of the pea row. The millet was sown 17 days after the peas were planted and yet it ripened before the Wonderful cowpeas were ready for haying. This was also true in the case of Japanese millet, and with two millets which were untrue to name, and which seemed to be Hungarian millet and common fox tail millet, the latter very much like German millet. Apparently the millets did not add to the yield of hay, but in the same test the yield of hay was materially increased when Amber sorghum and Wonderful peas were drilled together May 14. These two plants were ready for mowing at the same date.

In the following table are given the yields of hay afforded by cowpeas alone and in various combinations, all such mixtures being sown broadcast June 24, 1898, the peas, sorghum and corn at the rate of 64 pounds, the millet at the rate of 16 pounds per acre. The soil was a light sandy upland and no nitrogenous fertilizers were used.

Yields of hay from cowpeas alone and cowpeas in various mixtures.

Plot	COWPEAS.	MILLET, Etc.	Yield hay pr acre*
3N	Whippoorwill......	German millet	4560
3S	Whippoorwill......	Texas millet	4240
4N	Clay...............	Japanese barnyard millet	4240
4S	Clay...............		3860
5N	Whippoorwill......	Japanese barnyard millet	4320
5S	Clay...............	White Kafir corn	4720
6N	Clay...............	Texas millet	3840
6S	Clay...............	Stowell's sweet corn	3520
7N	Clay...............		3780
7S	Black..............	Texas millet	3780
8N	Clay...............	Early Amber sorghum	5440
8S	Black..............	Early Amber sorghum	5040

The stand of all the millets and of sweet corn and Kafir corn was very poor. The Japanese and German millet ripened earlier than was desirable. Kafir corn (a non-saccharine sorghum) and Amber sorghum were the only kinds which added to the yield of hay produced by cowpeas alone. Even this increase may have been chiefly water, for our notes show that the hay from the sorghum mixture was more moist than the other kinds and doubtless in unfavorable weather it would have been more difficult to cure.

We hope to continue the search for a grass-like plant pre-eminently suitable for sowing with cowpeas. Such a plant should have a fine stem like German millet and a longer period of growth.

Until this ideal plant is found we would recommend German millet as an aid in curing the early varieties of peas and possibly as suitable for drilling in or working in with a weeder several weeks after the later varieties have been sown. Amber sorghum is recommended as a means of increasing the yield on good land, but not as a means of making curing easier.

Most Profitable Method of Utilizing Cowpeas as Stock Food.

It may be of interest to record here the fragmentary data relative to this point that are afforded by our experiments at Auburn. Only with the variety Wonderful or Unknown have we made accurate determinations of the amount of seed and the amount of hay produced when the conditions of soil, fertilization, and culture were absolutely identical, this being done by making hay of the entire growth on certain plots and by harvesting only the seed on adjacent plots.

Relative yields of seeds and hay made by Wonderful cowpeas.

	Bus. seed.	Lbs. hay.
In 1897, drilled cowpeas yielded per acre	11.0	2420
In 1898, broacast cowpeas yielded per acre........	6.7	6400
In 1899 broadcast cowpeas yielded per acre........	7.9	2004
Average three years	8.5	3608

The 8.5 bushels of seed, with accompanying hulls, would weigh only about one-fifth as much as the weight of hay recorded above. Hence, it is evident that the most profitable use of the crop as stock food would be to utilize the hay rather than to wait for all the seed to ripen.

If, however, it should be impracticable to harvest and utilize the cowpea as hay, our next recommendation would be to pasture hogs or cattle on the pea fields, of course reserving a sufficient area to produce seed for the next year's planting.

With nearly mature cowpeas utilized in this way we obtained at Auburn the following returns for an acre of cowpea pasturage, after first deducting the cost of the additional food fed while the animals were grazing on cowpeas:

	Net return from 1 acre.
With milch cows in 1900 grazing on corn stalks and drilled cowpeas between corn rows (Ala. Bul. 114); butter at 20c, and beef on foot at 2 1-2c per lb........	$4.47
With milch cows in 1901 grazing on corn stalks and drilled cowpeas between corn rows (only butter considered)	$5.28
With shoats sold at 3 cents per pound, grazed in 1897 on cowpeas yielding about 13 bush. per acre (Ala. Bul. 93)	$10.65
With shoats in 1900, sold at 4c per lb. grazed on ripe drilled cowpeas (about 10 bus. per acre)	$4.90

When the cows grazed on parts of the corn and pea field where the peas were few or small and overripe the value of the pasturage on an acre fell far below the figures given above for 1901.

We have successfully preserved peavines in the silo, and at all stages of growth from early bloom until first pods color. They should be run through a silage cutter, and the silo heavily weighted. If the vines are put in without cutting the silage is often inferior and always difficult to remove. Special care in packing and weighting uncut peavines is necessary.

Methods of Harvesting Cowpea Seed.

Picking cowpeas is slow and expensive work. The charge for picking is frequently half the crop. If picking cannot be done promptly the crop is frequently ruined by mildew or rot of pods and seed. Hence some more rapid method is desirable. Possible methods are (1) cutting the vines with scythe or reaper when most of the pods are ripe, and later running the product through the threshing machine or beating the peas out by the slow process of flailing; (2) pulling the vines when the crop is thoroughly mature and beating out the seed with a flail; and (3) the use of a peavine picking machine.

While the latter is a possibility, we are unable to report any test made here of a pea-picking machine. It is to be hoped that the pea picker may be further simplified and especially that its price, which, as quoted to us, was prohibitive, being several times that of a mower, may be greatly reduced.

In 1898 we made a test of pulling Wonderful cowpeas when fully matured and beating them out with a flail. Even with hands unaccustomed to the work, pulling was much more rapid than picking, the rate per man being one and one-fourth acres per day. The process of beating out the peas was much slower, and this tedious work, together with the increased loss from shattered peas when the vines were pulled, and the removal of the plant food contained in the roots, were serious objections to this method. Apparently under some conditions it can be used to advantage as compared with picking.

Cutting the mature vines with a scythe early in the morning when there was least danger from shattering, was quite satisfactory, especially with the New Era variety, as it doubtless would be with any bunch pea on which the pods all ripen at about the same time and from which the leaves are dropped by the time the pods are mature. Scything will doubtless be more satisfactory with peas sown late because of their more erect and less tangled condition. The blade should be kept sharp to avoid shattering.

We have not tried the mower in harvesting cowpeas for seed because so many of the peas after cutting would be trampled over by the team in making its next round. The work of the reaper in green peavines indicated that it would be a satisfactory machine for harvesting mature cowpeas where the vines are not tangled.

Preliminary tests in running peavines through a grain thresher with concave removed, resulted in breaking about half the seed.

The very limited tests made here several years ago of two patterns of pea threshers, or hand machines, for beating out peas after the pods had been picked by hand, failed to show any great saving by the machines tested as compared with flailing. As the particular machines employed were afterwards claimed to be not fair representatives of those now on the market, we must await the results of further tests before drawing conclusions.

Our purpose is to continue the experiments as to the best methods of harvesting cowpeas.

Curing Cowpea Hay.

Long exposure to sunshine causes the leaflets, the most nutritious portion of the plant, to drop. Hence cowpea hay should be cured largely in its own shade, that is, with as little exposure as practicable of the mass of hay. This is the foundation principle in hay-curing, but its application will vary greatly according to the state of the weather and the succulence of the vines when cut. No definite rule can be given as to the necessary number of hours of sunshine, but a few examples will show the method pursued at this Station under same conditions:

1898—*Sept.* 13, A. M. Cut with scythe, leaving vines in small loose windrows. Windrows turned over with fork, having received about 8 hours of bright sunshine, and the exposed leaves having become just crisp enough to cause any perceptible loss of leaves in handling; weather during preceding 24 hours had been dry, but partly cloudy.

Sept. 14, 4-5 P. M. Piled vines in large cocks, where, the weather being fair, they were left until *Sept.* 21, when the vines, now dryer than necessary, were hauled and stored in barn.

If rain had been threatened hauling would have occurred about Sept. 15, or else canvas hay-caps would have been placed on the cocks.

1899—*Sept.* 12. Mowed Wonderful variety. Given 12 hours sunshine while spreading in swath; then raked and immediately cocked, in which condition it was left 48 hours before hauling. When hauled the hay contained somewhat more moisture than was thought safe for storing in large masses, though not too much for storing in thin layer.

1900—*Sept.* 24, A. M. Mowed Wonderful cowpeas in full bloom and having a few colored pods, growth not rank and containing some crabgrass.

Received in swath 24 hours' exposure, including about 10 of bright sunshine.

Sept. 25. A. M. Raked into windrows, and eight hours afterwards, or before night the same day, hauled.

Ordinarily it is safest not to haul direct from the windrows, but to leave the partially cured hay in cocks for several days and, if necessary, to open out these cocks an hour or two before hauling.

A part of the same field of cowpeas last referred to was employed in testing the practicability of very rapid curing and of storing hay in barn in very green condition, as is sometimes done with clover in the North, and as has been advocated for cowpeas in the South when threatened weather hastens hauling.

1900—*Sept.* 24. Immediately after the morning dew dried off, or about 8 to 9 A. M., the vines were mowed and left undisturbed and exposed on dry ground to bright sunshine for eight hours; then immediately raked, hauled, and stored 1,525 pounds of half-cured hay in small tight house.

It is claimed that when hay is stored in a very green condition it should be tightly packed and not afterwards moved, however much heat it may develop. This hay was packed in three feet deep and covered with other dryer hay, and the house closed.

The weather remained fair and dry for two weeks after this hay was stored. In five days the temperature had risen to 122 degrees at a point fifteen inches from the wall. This seemed to be the maximum temperature and by October 4 the thermometer had dropped to 110 degrees and white mould was abundant.

When the material was opened April 4, 1901, the entire mass, except for a space of about six inches next to each wall, was entirely rotten, and not simply blackened, as sometimes happens with an inferior but serviceable article of peavine silage.

The amount of material taken out was only 545 pounds, or about one-third as much as was put in, a part of the loss being moisture, but a large part of it being dry matter driven off by fermentation. This is an extreme case, but other instances where heat and white mould have developed in hay, field cured for several days, but stored too green, raises the suspicion that in our moist climate hay cannot be stored in as moist a condition as is sometimes done in the North. We should avoid both extremes, of storing hay when too green, and of exposing it too long in the field at the expense of color and nutritive value.

If urged to outline a general course of procedure founded on averoge results here, we would suggest cutting one day, and 24 hours later raking into windrows, where the hay may remain 24 hours; then cocking, and, if practicable, leaving these cocks in the field for two or three days, at the end of which time they may be opened for a few hours before hauling, or hauled without opening, according to the condition of the hay.

Special devices, for example, frames on which the stack or rick is to be built, or small poles with horizontal base on which the cock is built, have been recommended for use in curing peavine hay. Our experience with canvas hay caps as covering for hay cocks during wet weather is very satisfactory, though the first cost is considerable. By cutting the crop little at a time and at intervals of a week or more, the hay caps may be repeatedly used, and a few dozen caps may thus serve in the curing of a considerable area of cowpeas.

Additional experimental work in curing peavine hay is planned.

Composition of the Different Parts of the Cowpea Plant.

To obtain data as the relative value of leaves, stems, and other parts of the plant, both as food and as fertilizers, samples were taken of six of the varieties grown in 34-inch drills in the variety test of 1899. These plants had been sown in drills on June 23, so that when samples were taken September 12 they had been growing not quite three months, and in some varieties none of the pods had colored. The roots were dug out to a depth of six inches, which depth seemed to contain all the larger roots and nearly all of the smaller ones. If harvesting had been delayed a week or two, which, with all these varieties could have been done without their getting too old to make good hay, the yields would doubtless have been larger.

The average yield of the six varieties sampled was 1,745 pounds of hay per acre on the basis of the weights of the samples 41 days after the vines were cut, or 1,628 pounds of the same degree of dryness as the samples when analyzed two years later.

The following table shows in percentages what proportion of the entire plant consists of leaves, pods and blooms, coarse stems, fine stems, fallen leaves and stems, and roots with attached stubble about two inches long.

Percentages in entire air-dried plant of leaves, pods and blooms, fine stems, coarse stems, fallen leaves, and roots and stubble.

Variety.	Leaves.	Pods and blooms.	Fine stems and runners	Coarse runners.	Total available for food	Fallen Leaves and Fine Stems	Roots and 2-in. stubble
	%	%	%	%	%	%	%
Miller	21.0	1.6	19.9	14.8	57.3	17.7	25.0
Whippoorwill	17.0	23.3	16.4	18.7	75.4	3.7	21.6
Iron	17.0	18.3	12.3	18.3	65.9	15.4	19.0
Wonderful	18.7	7.8	15.3	18.0	59.8	19.2	20.3
Jones White	21.3	13.0	30.5	16.2	71.0	14.3	14.5
Clay	19.9	5.9	13.0	12.3	51.1	22.9	26.0
Average, 6 varieties	19.1	12.0	16.2	16.4	63.6	15.5	21.0

The chief difference among varieties as shown in the above table is in the percentage of pods and blooms. Naturally this was greatest in the Whippoorwill, for this was the earliest variety, and when cut September 12 it had more large pods than did any other. This earlier maturity also makes the Whippoorwill show the highest percentage of its weight available for animal food, viz.: 75.4 per cent. On the other extreme is Clay, which, when cut at this stage of immaturity, (only about 2 per cent. of pods having colored), had only about half the weight of the plant available for hay.

Taking the average of all varieties, 63.6 per cent. of the air-dry weight of the plant was contained in the hay.

The leaves, the most valuable portion perhaps except the pods, constituted 19 per cent. of the weight of the entire plant, or 30 per cent. of the weight of the hay.

Of the hay cut at a stage when on some varieties from 2 to 10 per cent. of the pods had colored, and when on others no pods had colored, the pods and blooms averaged 12 per cent. of its weight.

The leaves of all six varieties were mixed together after being weighed, and in like manner composite samples of the other parts of the plants were obtained.

The table below gives the composition of leaves, stems, etc., each sample being made up of a mixture of the corresponding parts of all six varieties. The analyses were made by the Chemical Department of this Station. In noting the small amounts of moisture it should be borne in mind that the samples had been kept in an office building for two years before the analyses were made. Weevil injured the pods so that they were not analyzed. The presence of considerable sand on roots and fallen leaves explains the high percentage of ash.

Composition of the parts of the cowpea plant, cut Sept. Average of 6 varieties.

	Moisture.	Ash.	Protien (muscle formers, etc.)	Nitrogen-free extract. (starch, etc.)	Crude fiber.	Ether extract. (fat, etc.)
	%	%	%	%	%	%
Leaves	10.65	10.98	22.44	31.69	16.78	7.46
Fine stems, etc	8.97	6.87	11.88	30.74	43.59	1.75
Coarse stems	8.47	4.92	9.44	33.12	42.19	1.86
Fallen leaves, etc	9.75	20.78	10.44	31.96	20.45	6.62
Roots and stubble	5.25	24.75	8.63	3.82	56.25	1.48

Let the reader note that the leaves were nearly twice as rich in protein as the fine stems; we may also infer from the small amount of crude fiber in the leaves that they are much more digestible than any other parts analyzed. These considerations emphasize the importance of retaining the leaves during the curing of pea-vine hay.

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(SCIENCE CONTRIBUTIONS.)

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ALABAMA.

Agricultural Experiment Station

OF THE

AGRICULTURAL AND MECHANICAL COLLEGE,

AUBURN.

THE FLORA OF THE METAMORPHIC REGION OF ALABAMA.

By F. S. EARLE.

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The Bulletins of this Station will be sent free to any citizen of the State on application to the Agricultural Experiment Station, Auburn, Alabama.

THE FLORA OF THE METAMORPHIC REGION OF ALABAMA.

BY F. S. EARLE.

The following list of the ferns and flowering plants of the Metamorphic Region of Alabama is based on the collections in the herbarium of the Alabama Polytechnic Institute at Auburn. The Alabama material in this herbarium was secured as follows: First, a few plants collected prior to 1895 by Dr. P. H. Mell and his assistants. (The bulk of this earlier material was destroyed by fire); second, a few plants collected during the Fall of 1895 by Dr. L. M. Underwood; third, plants collected during the Spring and Summer of 1896 by L. M. Underwood and F. S. Earle; fourth, plants collected during the Fall of 1896, during 1897, and the Spring and Summer of 1898 by C. F. Baker and F. S. Earle; fifth, plants collected from the Fall of 1898 to the Summer of 1901 by F. S. Earle and Mrs. F. S. Earle. Prior to 1897 attention had been devoted mainly to the fungi, flowering plants being taken only incidentally. Prof. Baker first suggested the systematic collection of the flowering plants, and the greater part of the species enumerated below were taken during the period of his residence at Auburn.

As Dr. Charles Mohr was known to be working on a flora of Alabama, the collections made prior to midsummer of 1897 were all sent to him for determination, and he was permitted to retain a full set, including all uniques, for his own herbarium. These plants are frequently referred to in his recent work on The Plant Life of Alabama that was published first by the United States Department of Agriculture as Volume 6, of the Contributions from the National Herbarium (issued July 31, 1901), and later (October, 1901), was reissued as a report from the Alabama Geological Survey. After midsummer of 1897 Dr. Mohr became so occupied in the preparation of the manuscript for this great work that at his request the sending of plants was discontinued, except as he occasionally asked for material in some special group. The later collections have been determined by Dr. J. K. Small, Mr. G. V. Nash, Dr. Edward L. Greene and other specialists, and by the writer, who has recently had an opportunity to compare some of the more doubtful material with the rich collections in the herbarium of the New York Botanical Garden. Some fifty species are reported by Dr. Mohr of our collecting that are not represented in the harbarium of the Polytechnic Institute; or at least are not represented under the name by which Dr. Mohr reports them. These species are included in this list, Dr. Mohr being cited in each case as the authority. These specimens will be found either in the herbarium of Alabama plants deposited by Dr. Mohr at the State University at Tuscaloosa, or in his private herbarium, which is now incorporated with the National Herbarium at Washington. In part, at least, these species represent uniques that did not chance to be again collected by us. There are, however, too many to be wholly accounted for in this way, and it seems probable that some of them represent cases where Dr. Mohr found occasion to change his original determination of the specimens. It has not been possible to trace these cases, for since the publication of Dr. Mohr's work I have not had access to the collections. It has seemed best to include these names, but with this word of warning as to the possibility of error through including two determinations for the same plant.

It so chanced that Dr. Mohr did very little collecting in that part of the State covered by this list. He, however, made one visit to the rugged mountainous region in Clay county and secured a number of plants that were not taken by us. A few plants have also from time to time been collected in this region by various members of the State Geological Survey. Fifty-two plants from these sources are recorded by Dr. Mohr from this region that do not appear in our collections. These are included in this list, the proper credit being given. It is probable that the specimens representing them are all in the herbarium at Tuscaloosa.

The Metamorphic region of Alabama as mapped by the State Geological Survey, is a triangular area lying on the eastern side of the State. It extends from near the southeast corner of Lee county at a point nearly opposite Columbus, Ga., northerly along the State line for about a hundred miles to a point in the northern part of Cleborne county. From this point the second side of the triangle extends southwestwardly for about the same distance, to a point in Chilton county, some three miles east of the line of the Louisville & Nashville railroad, and from here another hundred miles east-southeast to the point of beginning. This area comprises the southernmost extension of the Appalachian mountain system. It is underlaid by granite and other metamorphic rocks which exert their usual influence on the topography, giving high, rugged hills and frequent exposures of bare rock. There are, however, few vertical or overhanging cliffs, such as are frequent to the north and west in the region underlaid by the coal measures. The soil varies from a light and rather coarse sandy loam to the red hornblendic soil so characteristic of the Piedmont region of Georgia. In many places it is much incumbered with angular fragment of quartz and other hard resistant rocks. The original timber growth varied from almost pure long leaf pine forests at the southern border and along the bluffs of the Tallapoosa, to pure hardwood forests on the richer areas, especially to the northward. The greater part of the area was, however, a mixed forest of hardwoods and long or short leaf pines. The region is divided into nearly equal parts by the Tallapoosa river, the portion to the south and east being the high, broad ridge that forms the divide between this stream and the Chattahoochee. The northwestern portion forming the divide between the Tallapoosa and the Coosa is more rugged and broken, and in the Talladega Mountains reaches the highest elevations to be found in the State (2,300 feet). This is one of the most interesting parts of the State, and deserves much more extended study. It was visited only once by Dr. Mohr and once by the writer.

This metomorphic region is of special interest botanically since it constitutes the southernmost extension of the Carolina Life Zone. Many of the characteristic plants of the Appalachian system find here their most southerly 'stations while mingling with these northern representatives are many plants that have pushed up from the Gulf region. This mingling of the two floras accounts for the large number of species found. Of the 1146 species and varieties ennumerated in the following list, 94 are new to the State, and are not included in Dr. Mohr's work. These are indicated by an asterisk (*). There are 76 others that were previously known in Alabama only from the northern part of the State. These represent an extension of the known range in the State to the southward, and are marked by a dagger (†). There are also 167 species that represent a northerly extension of the known range within the State. These are indicated by a double dagger (‡). The larger number in this latter class is accounted for by the fact that Auburn, where the greater part of the collecting was done, is on the extreme southern border of the metamorphic Region. In fact the more sandy lands of the central pine belt extend at one point to within half a mile of the College building. All the plants collected in the neighborhood of Auburn have been included in the list whether they were taken from one side or the other of this rather vaguely defined line. While most of the plants that are marked with the double dagger are undoubtedly characteristic of the central pine belt rather than of the metamorphic hills; still it is probable that almost or quite all of them are to be found at some point on the more sandy lands that are clearly within this region proper.

The ecological relations of the flora have not in all cases been critically studied. The topographical features of the country will, of course, limit the plant societies or formations. The following situations have each a more or less clearly marked flora, and the brief note on habitat following each species in the list will, in most cases, indicate the nature of the locality where the plant should be sought. Beginning with the hydrophytes we may distinguish, first, the plants of the rapidly moving streams with which the region is abundantly supplied. Second, plants of pools and ponds. Ponds are not frequent, those found being mostly artificial. Third, marsh plants, inhabiting certain open miry places, and the open boggy banks of streams. Such areas are restricted and rather infrequent, but certain plants are found only in such localities. Fourth, swamp plants of the poorly drained timbered land along streams. In clay land there are likely to be "alder swamps," the prevailing growth being alder (*Alnus ru-*

gosa) and willow (*Salix nigra*) frequently with a dense undergrowth of cane (*Arundinaria tecta*). In sandy land swamps are more often "bay heads" with a prevailing growth of white bay (*Magnolia Virginiana*), red bay (*Persea pubescens*) and maple (*Acer rubrum.*) In places these "bay heads' 'develop into "Sphagnum bogs," where the ground is carpeted with peat moss (*Sphagnum sp.*). Each of these varieties of swamp has its own peculiar association of plants. Of mesophyte associations we have, 1st, the plants of the better drained creek and river bottoms, and, 2nd, the moister and richer northern slopes of the uplands. Such locations are usually heavily timbered mostly with hard woods, but occasionally mixed with loblolly pine (*Pinus Iaeda*) in the lowlands, and with the short leaf pine (*Pinus echinata*) in the uplands. These associations are rich in the number of species and include most of the more northern types. The plants from the Gulf region are to be sought on the dryer, more sandy uplands, and in the sandy bay heads and Sphagnum bogs. More or less distinctly zerophytic associations occupy the greater part of the upland area. Here we may distinguish. 1st, plants of the dry hardwood forests. These are usually found on the south slopes of the red clay hills; 2nd, plants of mixed woods, including long or short leaf pines and hard woods. This type of forest is the prevailing one over a large part of the entire region; 3rd, plants of the long leaf pine (*Pinus palustris*) forests. These are confined to the extreme southern border and to a strip along the hills bordering the Tallapoosa river. A large number of southern species are found in this long leaf pine association; 4th, an extremely zerophytic association found on exposed granite outcrops. Occasionally granite outcrops occur where they are somewhat moisted by a stream or spring and here we find still a different association of plants. Besides these which may be considered as constituting the natural plant covering of the region we have other associations whose advent is determined by the presence of man. Among these we may distinguish, 1st, the weeds of cultivated fields and gardens; 2nd, the weeds of pastures, roadsides and waste places; 3rd, the plants of abandoned or "turned out" fields, and, 4th, the plants of the second growth woods that ultimately reclothe these abandoned fields. The loblolly pine (*Pinus Taeda*) usually plays the leading part in this forestization, though with it are associated sweet gum (*Liquidambar*) black gum (*Nyssa sylvatica*), persimmon (*Diospyros*) and occasional individuals of numerous other trees.

Ophioglossaceae.

‡Botrychium biternatum (Lam.) Underw.

A single specimen, upland pasture, Auburn, (in Underwood Herbarium.)

Botrychium obliquum Muhl.

Frequent, creek-bottom woods.

Botrychium Virginianum (L.) Sw.

Occasional, creek-bottom woods.

Ophioglossum crotalophoroides Walt.

Occasional, grassy creek-bottom pastures.

Osmundaceae.

Osmunda cinnamomea L.

Common, swampy places.

Osmunda regalis L.

Common, swamps.

Polypodiaceae.

†Adiantum pedatum L.
Moist, shaded hillsides, river hills, Tallapoosa county.

Asplenium Bradleyi, D. C. Eaton.
Clay county (Mohr's Plant Life.)

Asplenium Filix-foemina (L.) Bernh.
Common, moist woods, variable.

Asplenium parvulum Mart. & Gall.
Clay county (Mohr's Plant Life.)

Asplenium platyneuron (L.) Oakes.
Common, rocky hillsides, granite outcrops.

Asplenium Irichomanes L.
Clay county (Mohr's Plant Life.)

Cheilanthes lanosa (Michx.) Watt.
Common, cliffs, granite outcrops.

Dryopteris Floridana (Hook.) O. Kuntze.
A single station, a swamp 6 miles south of Auburn, Lee co.

Dryopteris marginalis (L.) A. Gray.
Clay county (Mohr's Plant Life.)

†Dryopteris Noveboracensis (L.) A. Gray.
Clay county, creek bottoms.

‡Dryopteris Thelypteris (L.) A. Gray.
Occasional, creek bottoms, moist rich woods.

‡Onoclea sensibilis L.
Occasional, creek bottoms, clay land.

†Phegopteris hexagonoptera (Michx.) Fee.
Occasional, moist woods, creek bottoms.

Polypodium polypodioides (L.) A. S. Hitchcock.
Common, rocks, tree trunks.

Polystichum acrostichoides (Michx.) Schott.
Common, rocky hillsides in woods.

‡Pteridium aquilinum pseudocaudatum Clute.
Common, dry pine woods.

†Woodsia obtusa (Spreng.) Torr.
Frequent, rocky banks, granite outcrops.

Woodwardia areolata (L.) Moore.
Common, creek bottom swamps.

‡Woodwardia Virginica (L.) Smith.
A single collection, Auburn.

LYCOPODIACEAE.

Lycopodium pinnatum (Chapm.) Lloyd & Underw.
Frequent, sphagnum bogs.

SELAGINELLACAE.

Selaginella apus (L.) Spring.
Frequent, on the ground in swamps.

PINACEAE.

Juniperus Virginiana L.
Frequent, especially along roadsides.

Pinus echinata Mill.
The short leaf pine; common in mixed upland woods.

Pinus palustris Mill.
The long leaf pine; the prevailing timber on sandy lands, Lee county, and on dry rocky ridges bordering the Tallapoosa River.

Pinus Taeda L.
Loblolly pine, old field pine, swamp pine; common, swamps and uplands, especially as a second growth in abandoned fields.

TYPHACEAE.

Typha latifolia L.
Frequent, marshy places and shallow ponds and ditches.

SPARGANIACEAE.

Sparganum androcladum (Engelm.) Morong.
Occasional, marshy places.

ALISMACEAE.

‡Sagittaria latifolia Willd.
Common, marshes and ditches.

‡Sagittaria pubescens Muhl.
A single collection, swamp in river hills, Elmore county.

Poaceae.

Agrostis Elliottiana Schult.
Common, dry open places.

Agrostis hyemalis (Walt.) B. S. P.
Common, dry open places.

‡Agrostis intermedia Scribn.
A single collection, Auburn.

Aira caryophylla. L.
Common, dry open places.

Alopecurus geniculatus L.
Occasional, wet open places.

Andropogon argyraeus Schultes.
Common, dry woods and fields.

*Andropogon corymbosus (Chapm.) Nash.
Occasional, wet swampy places.

‡Andropogon Elliottii Chapm.
Occasional, dry woods.

Andropogon furcatus Muhl.
Infrequent, dry woods and roadsides.

‡Andropogon glomeratus (Walt.) B. S. P.
Frequent, wet swampy places. A smaller form with narrow panicles occurs in moist, upland woods.

Andropogon scoparius Michx.
Very common and variable. As here recognized it probably includes more than one species.

Andropogon Tracyi Nash.
Frequent, sandy uplands fields or thin woods.

Andropogon Virginicus L.
Very common, especially in old fields. (Broom sedge). Variable.

‡Anthaenatia villosa Beauv.
Occasional, moist sandy lands, south of Auburn.

Aristida lanosa Muhl.
Frequent, dry sandy lands, south of Auburn.

Aristlda purpurascens Poir.
A single collection, Auburn.

Arrhenatherum elatius (L.) Beauv.
A single collection, Auburn.

Arundinaria tecta (Walt.) Muhl.
Common, creek bottom swamps (Cane.)

Bromus unioloides (Willd.) H. B. K.
Occasional, fields, roadsides, etc. (escaped.)

†Brachyelytrum erectum (Schreb.) Beauv.
Occasional, rich upland woods.

Campulosus aromaticus (Walt.) Scrib.
Gold Hill, Lee county (Mohr's Plant Life.)

Capriola Dactylon (L.) O. Kuntze.
Abundantly introduced (Bermuda grass.)

‡Cenchrus echinatus L.
Occasional, sandy fields.

Chaetochloa glauca (L.) Scribn.
Common, cultivated fields.

*Chaetochloa perennis (Curtiss) Bicknell.
A single collection, Auburn.

Chrysopogon avenaceus (Michx.) Benth.
Common, upland woods and open places.

‡Chrysopogon nutans (L.) Benth.
Common, upland woods and open places.

Cinna arundinacea L.
Occasional, wet swampy places.

Dactyloctenium Aegypticum (L.) Willd.
Common, cultivated fields.

Danthonia sericea Nutt.
Frequent, dry woods and open places, clay or sand.

†Danthonia spicata (L.) Beauv.
Rocky hillsides, clay land, north of Auburn.

Eatonia filiformis (Chapm.) Vasey.
Frequent, dry woods.

Eatonia nitida (Spreng.) Nash.
Common, dry woods.

*Eatonia Pennsylvanica (D C.) A. Gray.
Dry open hillsides, Auburn.

*Eatonia Pennsylvanica (D C.) A. Gray.
A single collection, Auburn, creek bottom woods.

Echinochloa Crus-galli (L.) Beauv.
Occasional, gardens and barnyards.

Eleusene Indica (L.) Gaertn.
Common, cultivated fields.

*Elymus galbriflorus (Vasey) Scribn. & Ball.
Occasional, dry woods.

Elymus strictus Willd.
Lee county. Earle & Baker (Mohr's Plant Life.)

Elymus Virginicus L.
Lee County. (Mohrs Plant Life.)

‡Eragrostis hirsuta (Michx.) Nash.
Frequent, dry, open places.

Eragrostis major (L.) Host.
Common, cultivated fields.

Eragrostis pectinacea (Michx.) Steud.
Common, dry open places.

Eragrostis Purshii Schrad.
Occasional, cultivated fields.

‡Eragrostis refracta (Muhl.) Scribn.
Common, dry open places.

Erianthus alopecuroides (L.) Ell.
Common, upland woods, usually on clay.

*Erianthus compactus Nash.
Common, upland woods, usually on clay.

*Erianthus contortus Ell.
Common, poor usually sandy woods.

Festuca nutans Willd.
Frequent, moist woods.

*Festuca obtusa Spreng.
A single collection, Chambers county.

Festuca octoflora Walt.
Common, dry open places.

Festuca octoflora aristata (Torr.) Dewey.
Lee county, Earle & Baker (Mohr's Plant Life.)

Festuca sciurea Nutt.
Lee county, Earle & Baker (Mohr's Plant Life.)

Festuca Shortii Knuth.
Lee county, Earle & Baker (Mohr's Plant Life.)

‡Gymnopogon ambiguus (Michx.) B. S. P.
Frequent, dry sandy woods.

Homalocenchrus Virginicus (Willd.) Britt.
Frequent, wet swampy places.

Panicularia nervata (Willd.) O. Kuntze.
Occasional, cultivated fields.

Melica mutica Wall.
Frequent, upland woods.

Muhlenbergia capillaris (Lam.) Trin.
Frequent, dry open places.

†Muhlenbergia diffusa Schreb.
A single collection, Auburn.

Oplismenus hirtellus (L.) R. & S.
Occasional, moist sandy places in shade.

Panicularia nervata (Willd) O. Kuntze.
Common, wet shady places.

Panicum agrostoides Muhl.
Clay county (Mohr's Plant Life.)

*Panicum Alabamense Ashe.
Collected once, Auburn, swamp. This is very close to P. lucidum Ashe, and is probably identical with that species.

Panicum angustifolium Ell.
Very common, dry upland woods and roadsides.

†Panicum Auburne Ashe.
Collected once, Auburn, uplands. This is probably only a small form of P. sphaerocarpon. Ell.

Panicum barbulatum Michx.
Common, wet, swampy woods.

*Panicum Rogueanum Ashe.
Collected once, Auburn, uplands.

Panicum clandestinum L.
Occasional, alder swamps, clay land.

Panicum commutatum Schult.
Common, dry sandy uplands, roadsides, old fields and thin woods; often forming a dense sod.

Panicum depauperatum Muhl.
Common, dry uplands.

Panicum dichotomum L.
Very common, moist or dry land.

Panicum Earlei Nash.
Occasional, sandy swamps.

Panicum elongatum Pursh.
Occasional, damp places.

*Panicum hians Ell.
Frequent, low, wet places.

Panicum lanuginosum Ell.
Collected once, Chambers county.

‡Panicum laxiflorum Lam.
Very common, moist places. A form has been called P. caricifolium Scribn.

Panicum lucidum Ashe.
Frequent, wet places, sphagnum bogs, etc.

Panicum melicarium Michx.
Lee county, Earle & Baker (Mohr's Plant Life.)

Panicum microcarpon Muhl.
Frequent, moist uplands.

*Panicum mutabile Scribn. & Merrill.
Occasional, dry woods. These specimens have been determined as P. Joori Vasey.

Panicum neuranthum Greiseb.
Collected once, Auburn.

Panicum oligánthes Schult.
Occasional, sandy uplands.

Panicum Porterianum Nash.
Common, rich uplands.

Panicum pseudopubescens Nash.
Very common, dry uplands.

‡Panicum pubifolium Nash.
Frequent, sandy uplands.

Panicum pyriforme Nash.
Lee county, Earle & Baker (Mohr's Plant Life.)

Panicum Ravenelii Scribn. & Merrill.
Frequent, sandy uplands.

Panicum rostratum Muhl.
Common, uplands.

Panicum scoparium Lam.
Common, open sandy creek bottoms.

†Panicum Scribnerianum Nash.
Collected once, Auburn.

Panicum sphaerocarpon Ell.
Frequent, ditch banks and uplands.

Panicum Texanum Buckl.
Common, fields, introduced.

Panicum trifolium Nash.
Frequent, swamps.

‡Panicum verrucosum Muhl.
Common, shaded swamps.

Panicum virgatum L.
Common and variable, uplands and creek bottoms.

‡Panicum Webberianum Nash.
Common, dry exposed uplands, clay or sand.

*Panicum Yadkinensis Ashe.
Collected once, creek bottom, Auburn.

*Paspalum augustifolium Le Conte.
Frequent, upland woods, often confused with P. *laeve*. Michx.

Paspalum Boscianum Fleugge.
Common, cultivated fields.

Paspalum ciliatifolium Michx.
Common, upland woods.

Paspalum compressum (Sw.) Nees.
Common, wet pastures (Carpet grass.)

‡Paspalum dilatatum Poir.
Frequent, wet pastures and roadsides.

‡Paspalum distichum L.
Occasional, wet creek bottoms.

‡Paspalum Floridanum Michx.
Occasional, sandy uplands.

Paspalum laeve Michx.
Occasional, upland woods.

‡Paspalum longipedunculatum Le Conte.
Occasional, sandy uplands.

Poa annua L.
Common, dooryards, pastures and waste places.

Poa autumnalis Muhl.
Frequent, swampy woods.

†Poa pratensis L.
Occasional, roadsides and open woods.

‡Sorghum Halapense (L.) Pers.
Frequent, fields and waste places, (Johnson grass.)

Sporobolus asper (Michx.) Kunth.
Frequent, sandy woods and roadsides.

Sporobolus Indicus (L.) R. Br.
Common, pastures and door-yards, (Smut grass.)

Sporobolus junceus (Michx.) Kunth.
Frequent, dry sandy woods south of Auburn.

Stipa avenacea L.
Frequent, upland woods, sand or clay.

‡Syntherisma fimbriatum (Link) Nash.
Common, cultivated fields, (Crab grass.)

‡Syntherisma villosum Walt.
Occasional, cultivated fields.

Tricuspis seslerioides (Michx.) Torr.
Common, upland woods and open places.

Tripsacum dactyloides L.
Frequent, ditch banks and borders of moist fields.

*Trisetum aristatulum (Scribn. & Merrill) Nash.
Dry clay woods, Tallapoosa county.

†Trisetum Pennsylvanicum (L.) Beauv.
Frequent, moist woods.

Uniola latifolia Michx.
Frequent, rich upland woods.

Uniola laxa (L.) B. S. P.
Collected once, Auburn.

Uniola longifolia Scribn.
Frequent, upland woods and creek bottoms.

Cyperaceae.

Carex Atlantica Bailey.
Frequent, rich woods.

Carex cephalophora Muhl.
Frequent, dry wooded hillsides.

Carex crinita Lam.
A single collection, Auburn.

Carex debilis Michx.
Frequent, wet woods.

Carex granularis Muhl.
Lee county, Earle & Baker (Mohr's Plant Life.)

*Carex gynandra Schw.
Occasional, upland woods, Lee county, Tallapoosa county.

Carex interior Bailey.
Lee county, Earle & Baker (Mohr's Plant Life.)

Carex intumescens Rudge.
Frequent, swamps and ditch banks.

Carex laxiflora Lam.
Common, upland woods.

Carex laxiflora varians Bailey.
Lee county, Earle & Baker (Mohr's Plant Life.)

Carex leptalea Wahl.
Common, swamps.

Carex lurida Wahl.
Frequent, swamps and marshy places.

†Carex nigro-marginata Schw.
Frequent, dry rocky hillsides and granite outcrops. The most southerly known station for this rare *Carex*.

Carex oblita Steud.
Frequent, swamps.

*Carex ptychocarpa Steud.
Frequent, creek bottom swamps.

Carex sterilis Willd.
Frequent, swampy creek bottoms.

Carex stipata Muhl.
Frequent, wet open places.

*Carex tenera Dewey.
Common, rich woods.

†Carex Texensis (Torr.) Bailey.
Occasional, Auburn.

Carex triceps Michx.
Common dry upland woods.

Carex verrucosa Muhl.

Frequent, swamps, matures in midsummer. (=C. glaucescens Ell. of Mohr's Plant Life.)

Carex vulpinoidea Michx.

Common, wet places, ditch banks, etc.

Cyperus cylindricus (Ell.) Britt.

Frequent, sandy fields, etc.

Cyperus echinatus (Ell.) Wood.

Common, sandy uplands.

Cyperus filiculmis Vahl.

Frequent, sandy lands.

Cyperus Haspan L.

Frequent, marshy grass lands.

Cyperus Lancastriensis Porter.

Occasional, Lee county, Tallapoosa county.

Cyperus ovularis (Michx.) Torr.

Frequent, dry uplands.

Cyperus pseudovegetus Steud.

Frequent, swampy places.

Cyperus retrofractus (L.) Torr.

Common, dry sandy uplands.

Cyperus rotundus L.

Nut grass, a garden pest, locally abundant.

Cyperus stenolepis Torr.

Lee County, Earle & Baker. (Mohr, Plant Life.)

Cyperus strigosus L.

Common, fields and marshy places.

Eleocharis obtusa Schultes.

Common, marshy places.

Eleocharis prolifera Torr.

Occasional, marshy places.

Eleocharis tuberculosa (Michx.) R. & S.

Occasional, marshy places.

Fimbristylis autumnalis (L.) R. & S.

Common, marshy places and sandy fields.

*Fimbristylis laxa Vahl.

A single collection, Auburn.

*Fuirena squarrosa Michx.
Common, marshy places.

‡Fuirena squarrosa hispida (Ell.) Chapm.
Frequent, sphagnum swamps, etc.

‡Hemicarpa micrantha (Vahl) Britt.
Frequent, marshy places.

Kyllinga pumila Michx.
Common, wet places.

Rynchospora axillaris (Lam.) Britt.
Occasional, marshy places.

‡Rynchospora corniculata (Lam.) A. Gray.
Frequent, borders of ponds, etc.

Rynchospora cymosa Ell.
Frequent, marshy places.

Rynchospora filifolia Torr.
A single collection, Auburn.

Rynchospora glomerata (L.) Vahl.
Occasional, marshy places.

Rynchospora golmerata paniculata (A. Gray) Chapm.
Common, moist or dry open places, roadsides, etc.

*Rynchospora microcephala Britt.
A single collection, Auburn.

*Rynchospora patula A. Gray.
A single collection, Macon's Mill, Lee county.

Rynchospora rariflora Ell.
Occasional, marshy places.

‡Scirpus Eriophorum Michx.
Occasional, wet places, clay land.

Scleria ciliata Michx.
Frequent, upland woods.

Scleria oligantha Michx.
Frequent, upland woods.

*Scleria pauciflora Muhl.
A single collection, Auburn.

‡Scleria pauciflora glabra Chapm.
Frequent, moist woods.

Scleria triglomerata Michx.
Frequent, upland woods.

Stenophyllus capillaris (L.) Britt.
Frequent, sandy fields and marshy places.

PALMACEAE.

Rhapidophyllum hystrix (Fraser) Wendl. & Drude.
Rare, swamps, Lee county, clay and sand.

†Sabal Adansonii Guerns.
Rare, swamps, Lee count, in sand.

ARACEAE.

Arisaema quinatum (Nutt.) Schott.
Occasional, swamps and wet woods.

Arisaema triphyllum (L.) Torr.
Occasional, wet woods.

Orontium aquaticum L.
Clay county (Mohr's Plant Life.)

Peltandra Virginica (L.) Kunth.
Occasional, swamps and wet woods.

MAYACAEAE.

‡Mayaca Aubletii Michx.
Frequent, sandy swamps, usually with sphagnum.

XYRIDACEAE.

‡Xyris ambigua Beyrich.
A single collection, Auburn.

Xyris Caroliniana Walt.
Frequent, sandy borders of ponds, etc.

Xyris communius Kunth.
Lee county, J. D. Smith (Mohr, Plant Life.)

Xyris flexuosa Muhl.
Occasional, sandy swamps.

Xyris iridifolia Chapm.
Occasional, sandy swamps.

Xyris torta Smith.
Frequent, sandy swamps.

BROMELIACEAE.

‡Tillandsia usneoides L.
Occasional on trees in creek bottoms. All killed by the "freeze" of February, 1899.

COMMELINACEAE.

Commelina communis L.
Escaped, ditch banks, Auburn.

Commelina erecta L.
Frequent, dry hillsides.

Commelina hirtella Vahl.
Frequent, swampy creek bottoms.

‡Tradescantia hirsuticaulis Small.
River hills, Elmore county; also sandy woods, Lee county.

Tradescantia montana Shuttlw.
Rich upland woods, Clay county, Coosa county.

Tradescantia reflexa Raf.
Frequent, dry rocky hillsides, granite outcrops.

JUNCACEAE.

Juncoides echinatum Small .
Frequent, wooded hillsides.

Juncus acuminatus Michx.
Frequent, wet open places.

Juncus acuminatus debilis (A. Gray) Engelm.
Frequent, wet open places.

Juncus Canadensis A. Gray.
Occasional, Auburn.

‡Juncus diffusissimus Buckl.
Shallow pool in swamp, Auburn.

*Juncus Dudleyi Wiegand.
Frequent, dry woods and roadsides.

Juncus effusus L.
Frequent, wet, open places.

Juncus marginatus Rostk.
Frequent, wet, open places.

Juncus marginatus aristulatus (Michx.) Coville.
Common, wet open places.

‡Juncus polycephalus Michx.
Frequent, wet, open places.

‡Juncus repens Michx.
Sandy borders of ponds, in or out of water.

*Juncus robustus (Englm.) Coville.
A single collection, Auburn.

‡Juncus scripoides Lam.
Common, wet open places.

Juncus setaceus Rostk.
Common, wet open places.

Juncus tenuis Willd.
Common, especially along paths and woods roads.

Juncus Torreyi Coville.
Lee county, Earle & Baker (Mohr, Plant Life.)

Juncus trigonocarpus Steud.
A single collection, Auburn.

LILIACEAE.

‡Aletris farinosa L.
Occasional, borders of sandy swamps.

Allium mutabile Michx.
Common, creek bottoms, clay land, often in fields.

Allium veneale L.
Introduced, fields, etc., Auburn.

*Chamaelirium obovale Small.
Occasional, rich upland woods.

Chrosperma muscaetoxicum (Walt.) O. Kuntze.
Rare, taken once near Auburn.

Lilium Carolinianum Michx.
Occasional, rich upland woods.

Medeola Virginica L.
Occasional, moist, rich woods.

Melanthium Virginianum L.
Rare, taken once near Auburn.

Nothoscordium bivalve (L.) Britt.
(=Allium stratum.)
Common, dry rocky hillsides, granite outcrops, etc.

Polygonatum biflorum (Walt.) Ell.
Frequent, moist rich woods and creek bottoms.

†Polygonatum commutatum (R. & S.) Dietr.
Occasional, moist, rich woods, creek bottoms, etc.

*Triantha glutinosa (Michx.) Baker.
(=Tofeldia glutinosa Michx.)
Occasional, open marshy places.

Trillium stylosum Nutt.
Frequent, rich, moist woods, uplands or creek bottoms, usually on clay

Trillium Underwoodii Small.
Common, wooded creek bottoms, clay land north of Auburn, the type locality. A taller form with less conspicuously mottled shorter leaves occurs in sandy swanmps south of Auburn.

Uvularia perfoliata L.
Frequent, rich, moist woods, uplands or creek bottoms.

Uvularia sessilifolia L.
Frequent, rich, moist woods, creek bottoms, etc.

Vagnera racemosa (L.) Morong.
Frequent, rich, moist woods, creek bottoms, etc.

Yucca filamentosa L.
Occasional, roadsides and waste places.

Smilacaceae.

Smilax Bona-nox L.
Occasional, fence rows and thickets.

*Smilax cinnamomifolia Small.
In dry woods and old fields.

Smilax ecirrhata (Engelm.) Wats.
Frequent, rich upland woods.

Smilax glauca Walt.
Upland woods and old fields.

†Smilax herbacea L.
Frequent, rich woods.

Smilax hispida Muhl.
Frepuent, thickets, etc.

‡Smilax lanceolata L.
Frequent, moist thickets. (Jackson vine.)

‡Smilax laurifolia L.
Common, swamps (Bamboo vine.)

Smilax Pseudo-China L.
Occasional, fence rows and thickets.

Smilax pumila Walt.
Frequent, dry hillsides.

Smilax rotundifolia L.
Common, fence rows and thickets.

‡Smilax Walteri Pursh.
Occasional, swamps, sandy land.

Amaryllidaceae.

‡Atamosco Atamasco (L.) Greene.
Common, creek bottoms.

Hymenocallis occidentalis Kunth.
Rare, sandy creek bottoms.

Hypoxis hirsuta (L.) Coville.
Common, upland woods.

Manfreda Virginica (L.) Salisb.
(=Agave Virginica L.)
Frequent, dry rocky hillsides and granite outcrops.

Dioscoreaceae.

Dioscorea villosa L.
Common, a climbing vine in rich woods.

Iridaceae.

Gemmingia Chinensis (L) O. Kuntze.
Occasional, roadsides, etc.

†Iris cristata Ait.
Long-leaf pine woods, Tallapoosa county.

‡Iris verna L.
Long leaf pine woods, Tallapoosa county.

Sisyrinchium Carolinianum Bicknell.
Frequent, upland woods.

*Sisyrinchium flaccidum Bicknell.
Occasional, banks of streams.

‡Sisyrinchium grammoides Bicknell.
Frequent, upland woods.

BURMANNIACEAE.

‡Burmannia biflora L.
A single collection, swampy creek bottoms, sandy land.

ORCHIDACEAE.

Achroanthes unifolia (Michx.) Raf.
Rare, creek bottom swamps.

†Corallorhiza odontorhiza (Willd.) Nutt.
A single collection, Auburn.

Cypripedium parviflorum Salisb.
Clay county (Mohr's Plant Life).

Gyrostachys cernua (L.) O. Kuntze.
Frequent, moist places, creek bottoms, etc.

Gyrostachys gracilis (Bigel.) O. Kuntze.
Common, dry pine woods.

*Gyrostachys simplex (A. Gray) O. Kuntze.
A single collection, Auburn, dry pine woods.

*Gyrostachys vernalis (Engelm.) Small.
Occasional, pine woods.

Habenaria ciliaris (L.) R. Br.
Frequent, creek bottom woods, usually sand.

Habenaria clavellata (Michx.) Spreng.
Frequent, creek bottom woods, clay or sand.

Habenaria cristata (Michx.) R. Br.
Frequent, creek bottoms, sandy land.

Habenaria flava (L.) A. Gray.
Lee county, Underwood & Earle (Mohr's Plant Life.)

Habenaria lacera (Michx.) R. Br.
A single collection, Auburn.

†Habenaria quinquiseta (Michx.) Mohr.
(=H. Michauxii Nutt.)
A single collection, Auburn.

Hexalectris aphyllus (Nutt.) Raf.
Occasional, wooded hillsides, Lee county, Clay county, Elmore county.

Leptorchis lilifolia (L.) O. Kuntze.
Rare, creek bottom swamps.

Leptorchis Loeselii (L.) MacM.
Rare, creek bottom swamps, clay.

Limodorum tuberosum L.
Occasional, swamps, sphagnum bogs, etc., sand.

*Listera australis Lindl.
A single speciment, sandy swamp, south of Auburn.

Pogonia ophioglossoides (L.) Ker.
·Frequent, sphagnum bogs, etc.

Tipularia unifolia (Muhl.) B. S. P.
Occasional, moist woods, Lee county, Elmore county.

SAURURACEAE.

Saururus cernuus L.
Frequent, swamps.

JUGLANDACEAE.

Hicoria alba (L.) Britt.
Occasional, uplands.

Hicoria glabra (Mill.) Britt.
Common, dry upland woods, clay or sand.

Juglans nigra L.
Occasional, rich woods, usually clay.

MYRICACEAE.

‡Myrica cerifera L.
Occasional, sandy swamps.

SALICEAE.

Populus deltoides Marsh.
Occasional, creek and river bottoms.

Salix nigra Marsh.
Common, alder swamps, etc.

Betulaceae.

Alnus rugosa (Du Roi) Koch.
Very common in wet, swampy creek bottoms, the characteristic growth in such locations.

Betula lenta L.
Clay county (Mohr's Plant Life).

Betula nigra L.
Frequent along streams, clay land.

Carpinus Caroliniana Walt.
Frequent, creek bottoms.

Ostrya Virginiana (Mill.) Willd.
Frequent, creek bottoms.

Fagaceae.

Castanea dentata (Marsh.) Borkh.
Rare near Auburn, frequent further north, Chambers county, Tallapoosa county, etc.

Castanea pumila (L.) Mill.
Frequent, dry thickets.

Corylus rostrata Ait.
Clay county, Tallapoosa county, Randolph county (Mohr's Plant Life). It does not occur near Auburn.

Fagus Americana Sweet.
Common, moist woods, usually creek bottoms.

Quercus acuminata (Michx.) Sargent.
On high hills, Clay county; not seen about Auburn.

Quercus alba L.
Frequent, rich upland woods, clay land.

‡Quercus brevifolia (Lam.) Sargent.
Occasional, dry white sands south of Auburn.

†Quercus coccinea Wang.
Occasional, clay uplands, more abundant northward.

Quercus digitata (Marsh.) Sudw.
Very common, uplands, sand or clay.

*Quercus Margaretta Ashe.
Common, white sandy soils south of Auburn, but strictly confined to such locations. Very distinct from *Q. minor*, with which it has been confused.

Quercus Marylandica Muench.

(=Q. nigra of authors.) (Black jack.)

Very common, dry, sandy uplands, also on clay.

Quercus minor (Marsh.) Sargent.

Very common, dry uplands, sand or clay.

Quercus Phellos L.

Common, creek bottoms.

*Quercus prinoides Willd.

Occasional, creek bottoms.

†Quercus rubra L.

Occasional, moist clay uplands.

Quercus Schneckii Britton.

Common, uplands, clay or sand.

(=D. Texana Sargent, not Buckl.)

Quercus velutina Lam.

Occasional, clay uplands, frequent in upper counties.

Ulmaceae.

*Celtis Georgiana Small.

Common, dry woods, fence rows, etc., a shrub.

Celtis occidentalis L.

Clay county (Mohr's Plant Life).

Ulmus alata Michx.

Common, dry uplands.

Ulmus Americana L.

Occasional, moist woods, creek bottoms.

Moraceae.

Morus rubra L.

Occasional, rich woods, thickets.

Urticaceae.

Adicea pumila (L.) Raf.

Occasional, swamps.

Boehmeria cylindrica (L.) Willd.

Occasional, swamps.

Urticastrum divaricatum (L.) O. Kuntze.

A single collection, Clay county.

Loranthaceae.

Phorodendron flavescens (Pursh) Nutt.
Frequent, usually on oaks.

Santalaceae.

Nestronia umbellulata Raf.
(=Darbya umbellulata. A. Gray.)

A single station, creek bank, 3 miles northwest of Auburn.

Aristolochiaceae.

Aristolochia Nashii Kearney.
Occasional, moist, rocky banks.

Aristolochia Serpentaria L.
Occasional, moist rocky banks.

‡Hexastylis arifolium (Michx.) Small.
(=Asarum arifolium Michx.)
Common, rich upland woods.

*Hexastylis Ruthii (Ashe) Small.
Occasional, rich woods. (Specimen in Herb. N. Y. Bot. Gard.)

†Hexastylis Shuttleworthii (J. Britt.) Small.
Frequent, borders of sphagnum swamps.

Polygonaceae.

Brunnichia cirrhosa Banks.
A single collection, Tallapoosa county, river bank

Polygonum Convolvulus L.
Single collection, Opelika, on the railroad.

†Polygonum Hydropiper L.
Occasional, wet places, Lee county, Clay county.

Polygonum Opelousanum Riddell.
Common, moist fields, ditch banks, etc.

Polygonum Pennsylvanicum L.
Common, moist cultivated fields, etc.

Polygonum punctatum Ell.
Common, swamps and wet fields, often growing in standing water.

Polygonum sagittatum L.
Frequent, moist places, ditch banks.

Polygonum setaceum Baldw.
Common, swamps.

Polygonum Virginianum L.
Occasional, swampy woods.

Rumex Acetocella L.
Infrequent, pastures and waste places.

Rumex crispus L.
Common, roadsides and waste places.

‡Rumex hastatulus Muhl.
Very common, fields and waste places. A characteristic growth in abandoned fields.

Rumex obtusifolius L.
Occasional, fields and waste places.

‡Rumex pulcher L.
Streets of Auburn.

Chenopodiaceae.

Chenopodium album L.
Frequent, a weed in gardens and rich fields.

Chenopodium anthelminticum L.
Occasional, a weed in waste places.

Amaranthaceae.

Amaranthus hybridus paniculatus (L.) U. & B.
Common, a weed in gardens and rich fields.

Amaranthus spinosus L.
Frequent, a weed in gardens and rich fields.

Phytolaccaceae.

Phytolacca decandra L.
Common, rich fence rows and waste places.

Nyctaginaceae.

‡Boerhaavia erecta L.
Frequent, a weed in gardens and waste places.

Aizoaceae.

Mollugo verticellata L.
Common, a weed in gardens and fields.

Portulacaceae.

†Claytonia Virginica L.
One locality, wet, swampy woods 6 miles south of Auburn.

Portulacca oleracea L.
Occasional, a weed in rich gardens, not found in poor fields.

Talinum teretifolium Pursh.
Locally common, dry granite outcrops.

Caryophyllaceae.

Alsine media L.
Common, a winter weed in gardens and waste places.

†Alsine pubera (Michx.) Britton.
Rich wood, river hills Tallapoosa county.

Anychia dichotoma Michx.
Clay county (Mohr's Plant Life).

†Arenaria brevifolia Nutt.
Locally common, granite outcrops.

*Cerastium brachypodum (Engelm.) Robinson.
Occasional, fields.

†Carastium longipedunculatum Muhl.
Occasional, fields.

Cerastium viscosum L.
Common, gardens, fields and waste places.

Cerastium vulgatum L.
Common, gardens, fields and waste places.

Sagina decumbens (Ell.) T. & G.
Common, fields and gardens.

Saponaria officinalis L.
Occasional, roadsides, introduced.

Silene antirrhina L.
Occasional, fields and waste places.

Silene stellata (L.) Ait.
Occasional, rich woods, rocky banks of streams.

Silene Virginica L.
Frequent, rich upland woods, clay.

†Spergula arvensis L.
A single collection, Auburn (1894).

NYMPHAEACEAE.

Brasenia purpurea (Michx.) Casp.
In pond south of Auburn (Vaughn's Mill).

Nymphaea advena Soland.
Frequent, ponds and slow streams.

MAGNOLIACEAE.

‡Illicium Floridanum Ell.
Occasional, banks of streams, Lee county, south of Auburn.

Liriodendron Tulipifera L.
Frequent, moist hillsides and creek bottoms.

Magnolia macrophylla Michx.
Frequent, river hills, Tallapoosa county, Clay county.

Magnolia Virginiana L.
Common, sandy swamps.

ANONAECAE.

Asimina parviflora (Michx.) Dunal.
Frequent, dry or moist places.

Asimina triloba (L.) Dunal.
Banks of Tallapoosa river, Elmore county.

RANUNCULACEAE.

Actaea alba (L.) Mill.
Lee county, Baker & Earle (Mohr's Plant Life).

†Anemone Caroliniana Walt.
Rare, rocky hillsides (Wright's Mill.)

Anemone quinquefolia L.
Frequent, moist wooded hillsides.

Anemone Virginiana L.
A single collection, Chambers county.

‡Clematis crispa L.
Occasional, sandy swamps.

*Clematis glaucophylla Small.
Occasional, dry banks, Tallapoosa county, Elmore county. The leaves are less glancus than in the type and the achenes are narrower.

†Clematis reticulata Walt.
Rocky banks, Tallapoosa river, Elmore county.

Clematis Virginiana L.
Frequent, swamps, clay land.

Delphinium Carolinianum Walt.
Occasional, dry wooded hillsides.

†Hepatica Hepatica (L.) Karst.
Occasional, rich wooded hillsides.

Ranunculus abortivus L.
Frequent, fields and waste places.

Ranunculus hispidus Michx.
Frequent, moist or dry woods.

‡Ranunculus parviflorus L.
Occasional, wet, swampy places.

Ranunculus pusillus Poir.
Occasional, wet, swampy places.

Ranunculus pusillus Lindheimeri A. Gray.
Frequent, wet swampy places.

Ranunculus recurvatus Poir.
Occasional, creek bottom woods.

Ranunculus tener Mohr.
Lee county, Baker & Earle (Mohr's Plant Life).

†Syndesmon thalictroides (L.) Hoffmg.
Frequent, moist wooded hillsides.

Thalictrum clavatum D. C.
Clay county (Mohr's Plant Life).

Thalictrum purpurascens L.
Swampy places, Chambers county, Tallapoosa county.

†Trautvetteria Carolinensis (Walt.) Vail.
A single collection, shaded spring branch, river hills, Elmore county.

Xanthorrhiza apiifolia L. Her.
Frequent, along streams, often on rocky banks.

Berberidaceae.

†Caulophyllum thalictroides (L.) Michx.
One locality, 3 miles northwest of Auburn. Moist, wooded hillside.

Podophyllum peltatum L.
Occasional, creek bottoms.

Menispermaceae.

Calycocarpum Lyoni (Pursh) Nutt.
Rare, creek bottoms.

Cebatha Carolina (L.) Britt.
Frequent, thickets, becoming a troublesome weed in cultivated fields.

Calycanthaceae.

‡Butneria florida (L.) Kearney.
Frequent, moist, rich woods (Mohr's Plant Life credits *Butneria fertilis* to Lee county, but this seems to be an error.)

Lauraceae.

‡Persea pubescens (Pursh) Sargent.
Frequent, swamps, usually sand

Sassafras Sassafras (L.) Karst.
Occasional, mixed woods and cultivated fields.

Papaveraceae.

Sanguinaria Canadensis L.
Occasional, rich woods.

Cruciferae.

†Arabis Canadensis L.
Occasional, rocky creek banks, granite outcrops.

Arabis Virginica (L.) Trelease.
Very common, a winter weed in cultivated fields.

*Brassica juncea (L.) Cosson.
Streets of Auburn, introduced.

Bursa Bursa-pastoris (L.) Britt.
Common, fields and waste places.

Cardamine bulbosa (Schreb.) B. S. P.
Occasional, swampy woods, Lee county, Tallapoosa county.

‡Cardamine Pennsylvanica Muhl.
Occasional, rocky hillsides, granite outcrops.

Coronopus didymus (L.) J. E. Smith.
Common, upland fields and gardens.

Draba brachycarpa Nutt.
Common, upland fields, granite outcrops.

*Draba verna L.
Common, upland fields (*Draba Carolinia* is credited to Lee county in Mohr's Plant Life. This is an error, as the species is clearly *D. verna.*)

Lepidium Virginicum L.
Common, a weed in fields and gardens.

Capparidaceae.

Polanisia trachysperma T. & G.
Tallapoosa county (Mohr's Plant Life).

Droseraceae.

‡Drosera brevifolia Pursh.
Frequent, borders of sphagnum bogs.

Podostemaceae.

Podostemon ceratophyllum Michx.
Lee county, Baker & Earle (Mohr's Plant Life).

Crassulaceae.

†Diamorpha pusilla (Michx.) Nutt.
Locally abundant, granite outcrops.

Penthoraceae.

Penthorum sedoides L.
Occasional, swamps.

Saixfragaceae.

†Heuchera Americana L.
Frequent, dry rocky hillsides, granite outcrops.

Heuchera hispida Pursh.
Metamorphic hills, Talledega county (Mohr's Plant Life).

Parnassia asarifolia Vent.
Clay county (Mohr's Plant Life.)

Philadelphus grandiflorus Willd.
Lee county Underwood & Earle (Mohr's Plant Life). Very rare, seen only once.

†Saxifraga Virginiensis Michx.
Rare, in rock crevices, a single locality two miles northwest of Auburn.

Tiarella cordifolia L.
Occasional, moist, rocky woods, near springs.

Hydrangeaceae.

Decumaria barbata L.
Frequent, a high climbing vine in moist woods.

Hydrangea arborescens L.
Occasional, moist woods and rocky banks.

Hydrangea arborescens cordata (Pursh) T. & G.
Clay county (Mohr's Plant Life).

Hydrangea quercifolia Bartr.
Frequent, moist or dry woods.

Iteaceae.

Itea Virginica L.
Frequent, sandy swamps.

Hamamelidaceae.

Hamamelis Virginiana L.
Frequent, moist woods.

Liquidambar Stryaciflua L.
Common, a tree in mixed woods, both swamps and uplands, also in old fields and second growth timber.

PLATANACEAE.

Platanus occidentalis L.
Occasional, a large tree in creek bottoms.

ROSACEAE.

†Agrimonia mollis (T. & G.) Britt.
Common, moist woods.

Agrimonia parviflora Soland.
Moist woods, Clay county. Not seen at Auburn.

‡Agrimonia pumila Muhl.
Frequent, sandy creek bottoms.

‡Agrimonia striata Michx.
Occasional, moist woods, Lee county, Clay county, Coosa county.

†Amelanchier Botryapium (L.) D C.
Occasional, creek banks and borders of swamps.

*Amygdalus Persica L.
Freely escaped, roadsides, old fields and second growth woods. (Peach.)

Aronia arbutifolia (L. f.) Ell.
Common, swamps.

†Aruncus Aruncus (L.) Karst.
Rare, moist woods, Auburn.

‡Cotoneaster Pyracantha (L.) Spach.
Sparingly escaped, roadsides, Auburn.

Crataegus apiifolia (Marsh.) Michx.
Occasional, creek bottoms.

Crataegus collina Chapm.
Common, dry woods, usually sand.

Crataegus punctata Jacq.
Lee county, Baker & Earle (Mohr's Plant Life).

*Crataegus rubescens Ashe.
Frequent, dry woods, Auburn—the type locality.

Crataegus spathulata Michx.
Common, upland woods and granite outcrops.

Crataegus uniflora Moench.
Frequent, dry woods, sand or clay.

‡Duchesnea Indica (Andr.) Focke.
Common, creek bottoms.

Fragaria Virginiana L.
Common, dry open woods, usually on clay.

†Geum Canadense Jacq.
A single collection, Clay county.

Malus augustifolia (Ait.) Michx.
Frequent, along streams.

Opulaster opulifolius (L.) O. Kuntze.
Locally abundant, creek bottoms, Wright's Mill.

Porteranthus stipulatus (L.) Britt.
A single collection, Tallapoosa county.

Potentilla Canadensis L.
Frequent, dry banks and open woods.

*Potentilla humilis Poir.
A single collection, river hills, Tallapoosa county.

Prunus Americana Marsh.
Clay county (Mohr's Plant Life).

Prunus augustifolia Marsh.
Very common, old fields, roadsides (Old field plum.)

Prunus Caroliniana (Mill.) Ait.
Planted as an ornamental tree and sparingly escaped ("mock orange.")

Prunus gracilis Engelm.
Lee county, Baker & Earle (Mohr's Plant Life).

‡Prunus hortulana Bailey.
Frequent, rich clay woods, upland or creek bottoms. A large tree with loose, shelling bark.

Prunus injucunda Small.
Common, dry land, sand or clay. A small tree with close dark bark. (Southern sloe.)

Prunus serotina Ehrh.
Frequent, rich woods, clay or sand.

Prunus serotina neo-montana Sudw.
Clay county (Mohr's Plant Life).

Rosa humilis Marsh.
Common, dry woods and roadsides.

‡Rosa laevigata Michx.
Occasional, roadsides, introduced.

Rosa rubiginosa L.
Roadsides, Chambers county, introduced.

Rubus argutus Link.
Very common, creek bottoms, also uplands. Exceedingly variable, the common high bush blackberry.

Rubus argutus floridus (Tratt.) Bailey.
Occasional, dry uplands.

Rubus cuneifolius Pursh.
Very common, sandy uplands, the "old field" blackberry.

Rubus Enslenii Tratt.
Frequent, pine and mixed woods in shade.

Rubus invisus Bailey.
Frequent, rich woods and open places (dewberry).

Rubus trivialis Michx.
Common, roadsides and fields, evergreen dewberry. (Mohr's Plant Life credits *Rubus hispidus* to Lee county. This is certainly a mistake. The specimens so determined being forms of *R. trivialis*.)

MIMOSACEAE.

‡Albizzia Julibrissin Durazz.
Abundantly escaped, roadsides and woods. A good sized tree.

Morongia augustata (T. & G.) Britt.
Common, dry sandy woods.

CESALPINACEAE.

Cassia Marylandica L.
Occasional, fields and roadsides, Clay county.

Cassia occidentalis L.
Very common, a weed in cultivated fields.

Cassia Tora L.
Very common, a weed in cultivated fields.

Cercis Canadensis L.
Occasional, rich woods.

Chamaecrista multipinnata (Pollard) Greene.
Common, moist or dryish woods and thickets.

†Chamaecrista nictitans (L.) Moench?
A single doubtful specimen, Clay county. ,

Chamaecrista robusta Pollard.
Common, moist woods and thickets, creek bottoms.

Gleditsia triacanthos L.
Occasional, rich woods.

PAPILIONACEAE.

Amorpha fruticosa L.
Banks of Tallapoosa, Elmore county.

Amorpha virgata Small.
Clay county (Mohr's Plant Life).

Apios Apios (L.) MacM.
Occasional, rich woods and thickets, usually clay.

Baptisia megacarpa Chapm.
Tallapoosa county (Mohr's Plant Life).

‡Bradburya Virginiana (L.) O. Kuntze.
Frequent, thickets, etc. usually sand.

Chrysaspis dubia (Sibth.) Greene.
Occasional, roadsides and waste places.

†Chrysaspis procumbens (L.) Desv.
Occasional, roadsides and waste places.

Clitoria Mariana L.
Common, dry woods.

Cracca spicata (Walt.) O. Kuntze.
Common, dry woods.

Cracca Virginiana L.
Common, dry woods.

‡Crotalaria Purshii D. C.
A single collection, dry pine woods, Auburn.

Crotalaria rotundifolia (Walt.) Poir.
Frequent, dry woods and open places.

Crotalaria sagittalis L.
Occasional, dry woods and open places.

Dolicholus erectus (Walt.) Vail.
Frequent, dry pine or mixed woods.

†Dolicholus simplicifolius (Walt.) Vail.
Frequent, sandy pine woods.

†Dolicholus tormentosus (L.) Vail.
Occasional, sandy pine woods.

Falcata Pitcheri (T. & G.) O. Kuntze.
Cleburne county (Mohr's Plant Life.)

Galactea volubilis (L.) Britt.
Common, dry woods and thickets.

Lespedeza capitata Michx.
Occasional, sandy open woods.

†Lespedeza frutescens (L.) Britt.
Common, dry open woods.

Lespedeza hirta (L.) Ell.
Common, dry open woods.

Lespedeza Nuttallii Darl.
A single collection, Auburn.

Lespedeza procumbens Michx.
Common, dry open woods.

Lespedeza repens (L.) Bart.
Common, dry open woods.

Lespedeza striata (Thunb.) H. & A.
Common, old fields, roadsides and waste places (Japan clover).

*Lespedeza Stuvei Nutt.
Common, dry open woods.

Lespedeza Virginica (L.) Britt.
Common, dry open woods.

‡Medicago Arabica All.
Sparingly introduced, fields and roadsides (Bur clover.)

Meibomia arenicola Vail.
Frequent, dry sandy or rocky woods.

*Meibomia Dillenii (Darl.) O. Kuntze.
Common, fields and open woods.

Meibomia grandiflora (Walt.) O. Kuntze.
Rich woods, Coosa county. Not seen at Auburn.

Meibomia laevigata (Nutt.) O. Kuntze.
Common, rich shady woods.

†Meibomia Marylandica (L.) O. Kuntze.
Occasional, moist woods.

Meibomia Michauxii Vail.
Frequent, dry woods, usually on rocky hillsides.

Meibomia nudiflora (L.) O. Kuntze.
Occasional, moist rich woods, usually clay.

Meibomia obtusa (Muhl.) Vail.
Frequent, dry sandy woods.

Meibomia paniculata (L.) O. Kuntze.
Common, moist to dry woods.

*Meibomia paniculata Chapmani Britt.
Frequent, moist to dry woods.

*Meibomia paniculata pubens (T. & G.) Vail.
Occasional, dry woods.

†Meibomia rhombifolia (Ell.) Vail.
Frequent, dry woods.

Meibomia rigida (Ell.) O. Kuntze.
Occasional, dry woods.

‡Meibomia stricta (Pursh) O. Kuntze.
Occasional, sandy woods and roadsides.

‡Meibomia viridiflora (L.) O. Kuntze.
Occasional, pine or mixed woods.

Melilotus alba Desv.
Sparingly introduced, roadsides.

Phaseolus polystachyus (L.) B. S. P.
Occasional, rich woods.

Psoralea pedunculata (Mill.) Vail.
Common, pine or mixed woods.

Robinia hispida L.
Clay county (Mohr's Plant Life).

Robinia Pseudacacia L. ?
Rare, a shrub in dry woods (Wright's Mill).

‡Sesban macrocarpa Muhl.
Introduced, an occasional weed in sandy fields.

Strophostyles umbellata (Muhl.) Britton.
Frequent, dry open places.

Stylosanthes biflora (L.) B. S. P.
Frequent, dry woods and open places.

Stylosanthes riparia Kearney.
Frequent, woods and banks.

‡Trifolium Carolinianum Michx.
Common, roadsides and grassy places.

Trifolium pratense L.
Sparingly introduced, streets of Auburn.

Trifolium reflexum L.

Occasional, dry woods, often in rocky places.

Trifolium repens L.

Sparinginly introduced, streets and roadsides.

Vicia Hugeri Small.

Frequent, rich mixed woods. (*V. micrantha* Nutt in credited to Lee county, Mohr's Plant Life. This is an error, the plant being a narrow leaved form of V. *Hugeri.*)

Vicia sativa L.

Introduced, streets of Auburn.

Geraniaceae.

Geranium Caroliniaum L.

Common, fields and waste places.

Geranium maculatum L.

Occasional, swampy woods.

Oxalidaceae.

Oxalis recurva Ell.

Very common, dry pine and mixed woods, (*Oxalis cymosa* and *O. grandis* are both credited to Lee county, Mohr's Plant Life. Probably in each case this is an error.)

Oxalis stricta L.

Very common, fields and waste places.

Oxalis violacea L.

Common, dry open woods and rocky hillsides.

Linaceae.

Linum Floridanum (Planch.) Trelease.

Occasional, open sandy places.

Linum striatum Walt.

Occasional, moist woods, usually clay.

Rutaceae.

†Ptelea trifoliata L.

Occasional, river banks, Tallapoosa county, Clay county.

Simaroubaceae.

Ailanthus glandulosa Desf.
Occasional, roadsides, etc., introduced.

Meliaceae.

‡Melia Azederach L.
Abundant, roadsides, fence rows and old fields, introduced.

Polygalaceae.

Polygala ambigua Nutt.
Frequent, dry woods, Clay county, Tallapoosa county.

Polygala Boykini Nutt.
A single collection, Clay county. (Not Lee county, as stated in Mohr's Plant Life.)

Polygala cruciata L.
Occasional, sandy swamps.

Polygala Curtissii A. Gray.
Occasional, pine woods, Lee county, Clay county.

‡Polygala grandiflora Walt.
Frequent, dry pine and mixed woods.

Polygala incarnata L.
Occasional, dry pine and mixed woods.

Polygala Mariana Mill.
A single collection, Auburn.

‡Polygala nana (Michx.) D C.
Occasional, sandy land south of Auburn.

Polygala Nuttallii T. & G.
A single collection, Auburn.

Polygala polygama Walt.
Frequent, rich woods, usually clay.

Polygala verticillata L.
A single collection, Auburn. (S. M. Tracy.)

Euphorbiaceae.

Acalypha gracilens A. Gray.
Common, dry woods.

‡Acalypha ostryaefolia Riddell.
Occasional, fields and gardens.

Acalypha Virginica L.
One collection, Clay county, one Lee county.

Croton glandulosus septentrionalis Muell. Arg.
Occasional, roadsides and waste places.

Croton Texensis (Klotsch.) Muell. Agr.
Tallapoosa county (Mohr's Plant Life.)

Crotonopsis linearis Michx.
Frequent, dry roadsides and granite outcrops.

*Euphorbia apocynifolia Small.
Common, moist woods.

Euphorbia corollata L.
Common, dry woods.

*Euphorbia corollata paniculata Ell.
Common, dry woods.

Euphorbia maculata L.
Common, dry fields and waste places.

*Euphorbia olivacea Small.
Occasional, dry woods.

Euphorbia Preslii Guss.
Common, cultivated fields.

‡Jatropha stimulosa Michx.
Frequent, dry open woods, usually sand.

‡Stillingia ligustrina Michx.
Banks of Tallapoosa river, Tallapoosa county.

‡Stillingia sylvatica L.
Common, dry sandy land.

Tragia nepetaefolia Cav.
Frequent, rocky turned out fields.

‡Tragia urens L.
Occasional, dry open places.

CALLITRICACEAE.

Callitriche Austini Engelm.
Frequent, bare ground in old fields.

Callitriche heterophylla Pursh.
Frequent, floating in running water.

Anacardiaceae.

Rhus aromatica Ait.
Clay county (Mohr's Plant Life).

Rhus copallina L.
Common and variable, poor to rich soil, clay or sand.

Rhus glabra L.
Frequent, rich woods and thickets.

Rhus radicans L.
Common, a high climbing vine, (poison ivy, poison oak).

Rhus Toxicodendron L.
Frequent, dry rocky or sandy hills, a low shrub.

Rhus vernix L.
Frequent, sandy swamps, (Thunderwood).

Cyrillaceae.

‡Cyrilla racemiflora L.
Frequent, creek bottom swamps, sand or clay.

Aquifoliaceae.

*Ilex Beadlei Ashe.
Occasional, dry sand hills, south of Auburn.

Ilex decidua Walt.
Occasional, moist thickets.

‡Ilex glabra (L.) A. Gray. 1.
Frequent, sandy swamps.

‡Ilex glabra (L.) A. Gray. 2.
Occasional, banks of streams, clay land.

Ilex opaca Ait.
Common, moist to dry woods, usually sand.

Ilex monticola mollis (A. Gray) Britt.
A single collection, south of Auburn, sandy swamp.

Celastraceae.

Euonymus Americanus L.
Frequent, moist thickets.

1. Mohr's Plant Life, 604, credits *Ilex coreacea* (Pursh) Chap. to Lee county . This seems to be an error. The specimens cited prove to be a broad leaved form of *I. glabra*.

ACERACEAE.

‡Acer Floridanum (Chapm.) Pax.
Occasional, moist creek banks (Wright's Mill).

Acer leucoderme Small.
Frequent, moist rocky banks, etc., not in swamps.

†Acer Negundo L.
Local, Wright's Mill. Lee county.

Acer rubrum L.
Common, swamps.

Acer saccharum barbatum (Michx.) Trelease.
Clay county (Mohr's Plant Life).

HIPPOCASTANACEAE.

Aesculus parviflora Walt.
Occasional, northern edge of Lee county and northward, clay.

Aesculus Pavia L.
Common. dry woods.

BALSAMMACEAE.

Impatiens biflora Walt.
Frequent, swamps. clay land.

SAPPINDACEAE.

Cardiospermum halicacabum L.
Clay county (Mohr's Plant Life).

RHAMNACEAE.

‡Berchemia scandens (Hill) Trelease.
Frequent, moist thickets.

Ceanothus Americanus L.
Common, dry woods.

Rhamnus Caroliniana Walt.
Clay county (Mohr's Plant Life).

‡Ampelopsis arborea (L.) Rusby.
Occasional, south of Aubern (Wright's Mill).

Parthenocissus quinquefolia (L.) Planch.
Frequent, moist woods and thickets.

Vitis aestivalis Michx.
Frequent, dry or moist woods.

Vitis bicolor LeConte.
Clay county (Mohr's Plant Life).

Vitis cordifolia Michx.
Frequent, uplands, usually clay.

Vitis rotundifolia Michx.
Common, moist woods, creek bottoms, etc.

Tiliaceae.

Tilia heterophylla Vent.
Occasional, creek banks.

Malvaceae.

Malvastrum angustum A. Gray.
Tallapoosa county (Mohr's Plant Life).

‡Modiola Caroliniana (L.) Don.
Frequent, roadsides and waste places.

‡Sida Elliottii T. & G.
Frequent roadsides, Tallassee; also Lee county, sandy land. land.

Sida spinosa L.
Common, gardens and cultivated fields.

Hypericaceae.

‡Ascyrum hypericoides L.
Occasional, dry woods.

Ascyrum multicaule Michx.
Frequent, dry woods.

Ascyrum stans Michx.
Occasional, dry woods.

Hypericum Drummondii (Grev. & Hook.) T. & G.
Common, dry open places, roadsides, old fields, etc.

Hypericum maculatum Walt.
Frequent, rich woods.

Hypericum mutilum L.
Common, ditch banks, open moist places.

*Hypericum nudiflorum Michx.
A single collection, Auburn.

*Hypericum virgatum Lam.
Occasional, creek banks, Lee county, Clay county.

Sarothra gentianoides L.
Common, dry open places, roadsides, old fields, etc.

‡Triadenum petiolatum (Walt.) Britt.
A single collection, Tallapoosa county.

‡Triadenum Virginicum (L.) Raf.
A single collection, sandy land south of Auburn.

CISTACEAE.

‡Helianthemum Carolinianum Michx.
Occasional, dry open places, sandy land.

Lechea Leggettii Britt. & Hollick.
Frequent, sandy lands.

Lechea racemulosa Michx.
Occasional, dry open places.

Lechea villosa Ell.
Common, dry open places, roadsides, old fields etc.,

VIOLACEAE.

Cubelium concolor (Forst.) Raf.
Rich woods, Clay county.

‡Viola Caroliniana Greene.
Common, sandy woods and open grassy places.

*Viola cucullata Ait.
A single collection, river hills, Tallapoosa county.

Viola multicaulis (T. & G.) Britt.
Occasional, moist upland woods, clay.

Viola palmata dilatata Ell.
Frequent, rich upland woods.

Viola papilionacea Pursh.
Common, creek bottoms and moist ditch banks.

Viola pedata L.
Common, dry upland woods, clay or sand.

Viola pedata bicolor Pursh.
Occasional, with the last.

‡Viola primulaefolia australis Pollard.
Locally common, open marshy places, Lee county, Tallapoosa county.

Viola Rafinesquii Greene.
Very common, fields and waste places.

Viola striata Ait.
Clay county (Mohr's Plant Life).

‡Viola vicinalis Greene.
Frequent, open sandy woods, not found on clay.

Viola villosa Walt.
Rare, dry pine woods, Auburn.

PASSIFLORACEAE.

Passiflora incarnata L.
Common, a troublesome weed in fields, especially clay. A white flowered form is occasionally seen.

Passiflora lutea L.
Occasional, dry thickets.

CACTACEAE.

Opuntia humifusa Raf.
Frequent, roadsides and sandy land.

LYTHRACEAE.

‡Lagerstroemia Indica L.
Frequent, roadsides escaped, (Crape myrtle.)

Rotala ramosior (L.) Koehne.
A single collection, Clay county.

MELASTOMACEAE.

‡Rhexia ciliosa Michx.
A single collection, south of Auburn.

Rhexia lanceolata Walt.
Occasional, wet sandy places.

Rhexia Mariana L.
Frequent, wet sandy places.

‡Rhexia stricta Pursh.
A single collection, Auburn. (P. H. Mell.)

Rhexia Virginica L.
Frequent, wet sandy places, also on clay

ONAGRACEAE.

Epilobium coloratum Muhl.
Cleburne county (Mohr's Plant Life).

Gaura Michauxii Spach.
Frequent, dry woods and roadsides.

‡Hartmannia speciosa (Nutt.) Small.
Common, roadsides escaped.

Isnardia palustris L.
Occasional, ditches and running streams.

Jussiaea decurrens (Walt.) D. C.
Frequent, ditches and wet open places.

Jussiaea leptocarpa Nutt.
Frequent, ditches and wet open places.

‡Kneiffia linearis (Michx.) Spach.
A single collection, Chilton county.

*Kneiffia linifolia (Nutt.) Spach.
A single collection, Lee county.

*Kneiffia longipedicellata Small.
Common, dry open mixed woods, also in second growth woods, clay or sand.

*Kneiffia subglobosa Small.
Frequent, moist open sandy places.

Ludwigia alternifolia L.
Common, wet places, clay or sand.

‡Ludwigia hirtella Raf.
Swampy margins of ponds, sandy land.

‡Ludwigia linearis Walt.
Frequent, wet places, sandy land.

‡Oenothera laciniata Hill.
Common, fields and roadsides, a winter weed.

Oenothera laciniata grandis Britt.
A single collection, fields near Auburn.

Onagra biennis (L.) Scop.
Common, fields and roadsides.

HALORAGIDACEAE.

Myriophyllum sp.
Immature plants from a stream south of Auburn.

Proserpinaca pectinata Lam.
A single collection, roadside ditches, sandy land.

ARALIACEAE.

Aralia spinosa L.
Frequent, rich woods and thickets.

UMBELLIFERAE.

Angelica villosa (Walt.) B. S. P.
Frequent, dry pine and mixed woods, clay or sand.

Chaerophyllum Tainturieri Hook.
Common, a street and roadside weed, also in sandy swamps.

Centella Asiatica (L.) Urban.
Lee county (S. M. Tracy.) Specimen in herb. New York Bot. Garden.

*Cicuta maculata L.
Common, swamps, etc.

‡Daucus pusillus Michx.
Frequent, fields, roadsides and waste places

Deringa Canadensis (L.) O. Kuntze.
Rich woods, Clay county, Coosa county.

‡Hydrocotyle verticellata Thurnb.
Frequent, shaded thickets, clay or land.

Eryngium yuccaefolium Michx.
Common, dry woods and fields.

Oxypolis rigidus (L.) Raf .
Frequent, sandy swamps.

†Ligusticum Canadense (L.) Britt.
Frequent, open marshy places.

1. This is included under *E. integrifolum* Walt. in Mohr's Plant Life, 644, but it seems to differ from the pine-barren plant in more diffuse habit and broader leaves.

Oxypolis rigidus (L.) Britt.
Frequent, open marshy places.

Polytaenia Nuttallii D. C.
Lee county. Baker & Earle) (Mohr's Plant Life).

‡Ptilimnium capillaceum (Michx.) Hollick.
Common, sandy swamps.

Sanicula Canadensis L.
Common, moist to rather dry woods.

*Sanicula Floridana Bicknell. 1.
Frequent, dry upland woods.

Sanicula Marylandica L.
Occasional, moist woods.

Sanicula Smallii Bicknell.
Frequent, creek bottom woods.

Thaspium barbinode (Michx.) Nutt.
Occasional, moist thickets, etc

Thaspium trifoliatum aureum (Nutt.) Britt.
Occasional, creek bottom woods.

*Zizia aurea (L.) Koch.
A single collection, Clay county.

Zizia cordata (Walt.) D C.
Frequent, upland woods, sand or clay.

CORNACEAE.

Cornus Amomum Mill.
Common, along streams.

Cornus stricta Lam.
Lee county Earle & Baker (Mohr's Plant Life).

Cornus florida L.
Common, upland woods, clay or sand.

‡Nyssa biflora Walt.
Common, swamps.

1. Mohr's Plant Life, 645, includes this *with S. Canadensis.* The two seem sufficiently distinct. The shape of the leaves and the general aspect are so different that they can be distinguished at a glance.

Nyssa sylvatica Marsh.
Common, upland woods, usually clay.

Pyrolaceae.

†Chimaphila maculata (L.) Pursh.
Occasional, dry pine woods.

Monotropaceae.

Monotropa uniflora L.
Occasional, rich woods.

Ericaceae

Azalea arborescens Pursh.
Rare, along streams, clay land

Azalea nudiflora L.
Common, rich woods.

Azalea viscosa L.
Common, swamps, variable.

Azalea viscosa glauca (L.) Michx.
Lee county, Earle & Underwood (Mohr's Plant Life).

Bathodedron arboreum (Marsh.) Nutt.
Common, dry woods (Vaccinum Arboreum Marsh.)

Epigaea repens L.
Rare, dry hillsides, Lee county, Tallapoosa county.

Gaylussacia dumosa (Andr.) T. & G.
Common, dry hillsides.

Gaylussacia frondosa (L.) T. & G.
Frequent, dry rocky hillsides.

*Gaylussacia nana (A. Gray) Small.
Frequent, dry rocky hills.

Kalmia latifolia L.
Common, along streams.

†Leucothoë racemosa (L.) A. Gray.
Border of ponds, sandy land.

Oxydendren arboreum (L.) D C.
Frequent, dry or moist woods.

‡Pieris nitida (Bartr.) B. & H.
Frequent, sandy swamps.

Polycodium melanocarpum (Mohr) Greene.
Occasional, dry upland woods.

Polycodium melanocarpum candicans (Mohr).
Occasional, dry upland woods.

Polycodium stamineum (L.) Greene.
Frequent, dry woods.

*Rhododendron punctatum Andr.
A single collection, river hills, Tallapoosa county.

‡Vaccinium amoenum Ait.
Occasional, dry hillsides.

Vaccinium corymbosum L.
Occasional, open woods.

Vaccinius Elliottii Chapm.
Common, banks of streams.

‡Vaccinium fuscatum Ait.
Common, sphagnum bogs.

Vaccinium Myrsinites Lam.
Common, dry rocky hills.

Vaccinium Myrsinites glaucum A. Gray.
Occasional, with the type.

Vaccinium tenellum Ait.
Occasional, moist hillsides.

Vaccinium vacillans Kalm.
Frequent, dry rocky hills.

‡Vaccinium virgatum Ait.
Occasional, banks of streams.

Xolisma ligustrina (L.) Britt.
Frequent, moist woods, banks of streams.

PRIMULACEAE.

†Lysimachia quadrifolia L.
A single collection, Talladega county.

Samolus floribundus H. B. K.
Frequent, swamps.

Steironema ciliatum (L.) Raf.
Frequent, moist woods.

Steironema lanceolatum (Walt.) A. Gray.
Occasional, moist woods.

Steironema lanceolatum augustifolum A. Gray.
Lee county. (Earle & Baker) (Mohr's Plant Life).

*Steironema quadriflorum (Sims) A. S. Hitchcock.
A single collection, moist woods, Auburn, clay land.

Steironema tonsum (Wood) Bicknell.
A single collection, Clay county.

EBENACEAE.

Diospyros Virginiana L.
Common, dry woods (=Vaccinum Arboreum Marsh.)

SIMPLOCACEAE.

Symplocos tinctoria (L.) L'Her.
Frequent, moist hillsides and along streams.

STYRACEAE.

Mohrodendron Carolinum (L.) Britt.
Common, along streams.

†Mohrodendron dipterum (Ell.) Britt.
Banks of Tallapoosa river, Elmore county, Tallapoosa county.

Styrax Americana Lam.
Common, along streams.

Styrax grandifloria Ait.
Rare, upland woods, clay land.

OLEACEAE.

Chionanthus Virginica L.
Occasional, moist woods and along streams.

Fraxinus lanceolata Borck.
Occasional, creek and river bottoms.

†Osmanthus Americanus (L.) B. & H.
Frequent, along streams and moist hillsides.

LOGANIACEAE.

*Buddleia Japonica Hemsl.
Sparingly escaped, roadsides.

Gelsemium sempervirens (L.) Ait.
Frequent, climbing over trees in moist or dry thickets, sand or clay (Yellow jasmine.)

Polypremum procumbens L.
Common, dry field and waste places.

Spigelia Marylandica L.
Frequent, rich, shady woods.

GENTIANACEAE.

Bartonia Virginica (L.) B. S. P.
Rare, sphagnum swamps.

†Gentiana Saponaria L.
Frequent, along creek banks.

Gentiana villosa L.
Occasional, dry woods, usually clay.

Sabbatia angularis (L.) Pursh.
Occasional, dry rich woods, usually clay.

Sabbatia Boykinii A. Gray.
Rare, dry woods, Clay county, Coosa county.

MENYANTHACEAE.

‡Linmanthemum lacunosum (Vent.) Griseb.
Ponds south of Auburn.

APOCYNACEAE.

Amsonia Amsonia (L.) Britt.
Frequent, creek bottom woods.

Apocynum cannabinum L.
Rare, sandy fields, south of Auburn.

ASCEPIADACEAE.

‡Asclepias amplexicaulis Michx.
Occasional, dry sand hills south of Auburn, never in clay.

Asclepias obtusifolia Michx.
Occasional, thin upland woods, clay or sand.

Asclepias tuberosa L.
Common, dry woods and roadsides.

Asclepias variegata L.
Frequent, dry woods and roadsides, sand or clay.

Asclepias verticillata L.
Frequent, dry woods and roadsides, sand or clay.

Vincetoxicum hirsutum (Michx.) Britt.
Occasional, rich woods, usually clay.

CONVOLVULACEAE.

‡Breweria humistrata (Walt.) A Gray.
Frequent, dry sandy pine woods.

‡Convolvulus repens L.
Frequent, dry woods, sand or clay.

Ipomoea barbigera (Don.) Sweet.
Common, upland fields.

Ipomoea hederacea Jacq.
Lee county, Earle (Mohr's Plant Life).

Ipomoea lacunosa L.
Occasional, creek bottom fields.

Ipomoea pandurata (L.) Meyer.
Frequent, dry woods and roadsides.

Ipomoea purpurea (L.) Roth.
Lee county, Earle (Mohr's Plant Life).

‡Jacquemontia tamnifolia (L.) Griseb.
Common, a weed in fields.

†Quamoclit coccinea (L.) Moench.
Occasional, cultivated fields.

CUSCUTACEAE.

Cuscuta arvensis Beryrich.
Lee county, Earle (Mohr's Plant Life).

Cuscuta sp.
Other species occur, but the specimens have not been determined.

POLEMONIACEAE.

Phlox amoena Sims.
Frequent, dry pine and mixed woods.

Phlox glaberrima L.
Frequent, dry mixed woods.

Phlox maculata L.
Occasional, upland woods.

Phlox paniculata L.

A single collection, Coosa county.

Phlox paniculata acuminata (Pursh) Chapm.

Lee county, Baker & Earle (Mohr's Plant Life).

Phlox pilosa L.

Frequent, moist mixed woods.

Hydrophyllaceae.

‡Nana quadrivalvis (Walt.) O. Kuntze.

Margin of pond south of Auburn.

Phacelia dubia (L.) Small.

Locally abundant, dry granite outcrops.

Boraginaceae.

Heliotropium Indicum L.

Occasional, roadsides and waste places.

Lappula Virginica (L.) Greene.

Occasional, moist woods, clay land.

Collinsonia scabriuscula Ait.

Occasional, open grassy places.

Onosmodium Carolinianum (Lam.) A. D C.

Occasional, dry sandy fields and open woods.

Verbenaceae.

Callicarpa Americana L.

Common, dry woods, sand or clay. A form with white fruit occurs.

Verbena bracteosa Michx.

Occasional, roadsides and waste places.

‡Verbena Caroliniana Michx.

Frequent, dry sandy woods.

*Vitex Agnus-castus L.

Freely escaped, roadsides, etc.

1. Immature specimens of this plant were determined as Myosotis Virginica and were so reported in Mohr's Plant Life, 691. The true M. Virginica has not so far been found.

Labiatae.

†Blephila ciliata (L.) Raf.
Frequent, dry hillsides, clay land.

†Clinopodium Nepeta (L.) O. Kuntze.
A single collection, Clay county.

Clinopodium Carolinianum (Michx.) Heller.
Locally common, dry sandy flats, banks of Tallapoosa river, Tallapoosa county.

Collinsonia anisata Pursh.
Common, dry pine and mixed woods.

*Collinsonia Canadensis punctata A Gray.
A single collection, swamp south of Auburn.

Collinsonia scabriuscula Ait.
Opelika, Lee county (Mohr's Plant Life).

Hedeoma pulegioides (L.) Pers.
Tallapoosa county, Clay county, not found at Auburn.

‡Koellia albescens (T. & G.) O. Kuntze.
A single collection, Clay county.

Koellia flexuosa (Walt.) Mac M.
Occasional, moist open places.

*Koellia incana (L.) O. Kuntze.
Common, dry open woods.

Koellia pycnanthemoides (Leavenw.) O. Kuntze.
Common, dry open woods.

Lamium amplexicaule L.
Common, fields and gardens, a Winter weed.

Lycopus Virginicus L.
Common, wet swampy thickets.

Mentha piperata L.
Spring branches, Tallapoosa county.

‡Mesosphaerum rugosum (L.) Pollard.
Frequent, sandy swamps.

*Monarda mollis L.
Frequent, Clay county, not seen at Auburn.

Monarda punctata L.
Frequent, dry thickets.

Nepeta cataria L.
Clay county (Mohr's Plant Life).

Prunella vulgaris L.
Frequent, moist places.

Salvia azurea Lam.
Frequent, open sandy places, roadsides, etc.

Salvia lyrata L.
Common, dry or moist woods.

Salvia urticifolia L.
Frequent, dry open woods.

Scutellaria cordifolia Muhl.
Occasional, mixed woods, clay land.

Scutellaria integrifolia major Chapm.
Frequent, moist creek bottoms, usually sandy land.

*Scutellaria hyssopifolia L.
A single collection, Auburn.

Scutellaria laterifolia L.
A single collection, Auburn.

Scutellaria pilosa Michx.
Frequent, dry mixed woods.

*Scutellaria venosa Kearney.
Collected once, Tallapoosa county.

Trichostema dichotomum L.
Frequent, Clay county, not seen at Auburn.

‡Trichostema lineare Nutt.
Frequent, open sandy woods.

SOLANACEAE.

Datura Tatula L.
Common, barnyards and rich gardens.

Physalis angulata L.
Occasional, gardens and fields.

*Physalis ———
Occasional. This is a striking species, the plant covered with long whitish hairs. Dr. Rydberg considers it new and will soon publish a description. An unnamed fragment of the same thing collected by Dr. Chapman is in the Columbia University herbarium.

Physalis Virginiana Mill.
Frequent, dry open woods, clay or sand.

Physalodes Physalodes (L.) Britt.
Occasional, gardens and rich fields.

Solanum Carolinense L.
Common, fields and gardens.

Solanum nigrum L.
Common, rich fields and gardens.

Solanum pseudocapsicum L.
Occasional, roadsides.

Scrophulariaceae.

‡Afzelia cassinoides (Walt.) Gmel.
A single collection Clay county.

Afzelia pectinata (Pursh) O. Kuntze.
Frequent, dry pine or mixed woods.

Buchnera Americana L.
Rare, moist open places.

Chelone glabra L.
Rare, moist thickets.

*Dasystoma bignoniflora Small.
A single collection, Clay county.

Dasystoma flava (L.) Wood.
Frequent, dry woods.

Dasystoma pectinata (Nutt.) Benth.
Lee county, Baker & Earle (Mohr's Plant Life).

Dasystoma laevigata (Raf.) Chapm.
Frequent, dry woods.

†Dasystoma Virginica (L.) Britt.
Frequent, rich woods.

*Gerardia microphylla (A. Gray) Small.
Occasional, sandy pine woods.

Gerardia Plukenetii Ell.
Frequent, dry upland woods, clay or sand.

Gerardia purpurea L.
Occasional, wet swampy places.

Frequent, dry woods.

Gratiola Floridana Nutt.
Locally abundant, swamps. Lee county, Tallapoosa county.

‡Gratiola pilosa Michx.
Frequent, moist open places.

‡Gratiola sphaerocarpa Ell.
Frequent, boggy places.

Ilysanthes attenuata (Muhl.) Small.
A single collection, bank of pond south of Auburn.

†Ilysanthes refracta (Ell.) Benth.
Occasional, moist granite outcrops.

Linaria Canadensis (L.) Dumort.
Common, fields and gardens.

‡Micranthemum emarginatum Ell.
A single collection, border of pond south of Auburn.

*Mimulus ringens. L
Frequent, wet ditch banks, etc., clay land.

Monniera acuminata (Walt.) O. Kuntze.
Frequent, wet, swampy woods.

Pedicularis Canadensis L.
Occasional, moist pine or mixed woods.

Penstemon hirsutus (L.) Willd.
Common, dry woods.

Scrophularia Marylandica L.
Infrequent, the only collection from Coosa county.

Verbascum Blattaria L.
Rare about Auburn, becoming common farther north.

Verbascum Thapsus L.
Occasional, roadsides and waste places.

‡Veronica arvensis L.
Occasional, fields and waste places.

Veronica peregrina L.
Frequent, fields and waste places.

Lentibulariaceae.

†Utricularia fibrosa Walt.
In mud border of pond south of Auburn ,

‡Utricularia subulata L.
Frepuent, sandy swamps.

Orobranchaceae.

†Conopholis Americana (L.) Walt.
Frequent, moist woods, growing on oak, beech and sweet gum roots.

†Leplamnium Virginianum (L.) Raf.
Frequent, moist woods.

†Thalesia uniflora (L.) Britt.
Rare, mixed woods.

Bignoniaceae.

Bignonia crucigera L.
Frequent, along streams.

Campsis radicans (L.) Seem.
(=Tecoma radicans D C.)
Common, thickets, roadsides and fields.

Catalpa Catalpa (L.) Karst.
Occasional, along streams.

Acanthaceae.

Dianthera Americana L.
Frequent, in running streams.

Ruellia ciliosa hybrida (Pursh) A. Gray.
Lee county, Baker & Earle (Mohr's Plant Life).

Ruellia ciliosa parviflora (Nees) Britt.
Occasional, roadsides and mixed woods, clay land, also on granite outcrops.

Ruellia strepens L.
Clay county (Mohr's Plant Life).

Plantaginaceae.

Plantago aristata Michx.
Common, roadsides and waste places.

*Plantago elongata Pursh.
Collected once, creek bottom pasture, Auburn.

Plantago heterophylla Nutt.
Common, fields and waste places.

Plantago lanceolata L.
Occasional, roadsides and grassy places.

Plantago Rugelii Dce.
Occcasional, moist pastures and roadsides.

Plantago Virginica L.
Common, fields, pastures and waste places.

Rubiaceae.

Cephalanthus occidentalis L.
Common, swamps and moist thickets.

Diodia teres Walt.
Very common, old fields, roadsides, etc.

Diodia Virginiana L.
Common, ditch banks and wet fields.

Galium aparine L.
Occasional, gardens and moist places.

Galium circaezans Michx.
Collected once, Auburn, not typical.

*Galium Claytoni Michx.
Collected once, shaded spring bog, Auburn.

Galium pilosum Ait.
Frequent, pine and mixed woods.

‡Galium pilosum puncticulosum (Michx.) T. & G.
Frequent, dry pine woods.

‡Galium uniflorum Michx.
Collected once, moist, rich woods, Auburn.

*Galium tinctorium L.
Occasional, moist woods.

†Galium triflorum Michx.
Occasional, rich woods, Lee county, Clay county.

Houstonia calycosa (Shuttly.) Mohr.
Tallapoosa county (Mohr's Plant Life).

Houstonia coerulea L.
Common, open pine and mixed woods.

Houstonia longifolia Gaertn.
Occasional, moist, rocky banks.

‡Houstonia minor (Michx.) Britt.
Common, pastures and open places.

Houstonia purpurea L.
Common, rich woods, usually on clay.

Houstonia tenuifolia Nutt.
Frequent, dry open, diciduous woods clay land.

Mitchella repens L.
Common, moist creek banks and sandy swamps.

‡Oldenlandia uniflora L.
Frequent, borders of sphagnum swamps.

‡Richardia scabra L.
Common, sandy cultivated fields, Lee county, Elmore county.

Caprifoliaceae.

Lonicera flava Sims.
Clay county (Mohr's Plant Life).

Lonicera Japonica Thunb.
Abundantly escaped roadsides, fields and thickets.

Lonicera sempervirens L.
Frequent, climbing in moist thickets.

Sambucus Canadensis L.
Common, thickets and roadsides.

†Symphoricarpus Symphoricarpus (L.) MacM.
Collected once, Clay county.

Viburnum acerifolium L.
Clay county (Mohr's Plant Life).

Viburnum nudum L.
Common, sandy swamps.

Viburnum rufotomentosum Small.
Occasional, moist or dry open woods.

Valerianaceae.

Valerianella radiata (L.) Dufr.
Common, creek bottom fields.

Campanulaceae.

Campanula Americana L.
Collected once, Coosa county.

Campanula divaricata Michx.
Frequent, granite ledges Lee county, Tallapoosa county.

‡Specularia biflora (R. & P.) A. Gray.
Common sandy pastures and roadsides.

Specularia perfoliata (L.) A. DC.
Common, fields and roadsides.

Lobeliaceae.

Lobelia amoena Michx.
Frequent, sandy swamps.

Lobelia cardinalis L.
Frequent, swampy creek bottoms, often on clay.

Lobelia inflata L.
Creek bottoms, Clay county, rare at Auburn.

Lobelia leptostachys A. D C.
Clay county (Mohr's Plant Life).

Lobelia Nuttallii Roem. & Schult.
Clay county (Mohr's Plant Life).

Lobelia puberula Michx.
Common, open woods, often near streams.

Lobelia spicata Lam.
Dry woods, Elmore county Coosa county Clay, county not seen at Auburn.

Lobelia syphilitica L.
Clay county (Mohr's Plant Life).

Chicoriaceae.

Adopogon Carolinianum (Walt.) Britt.
Common, fields, roadsides and waste places.

Hieracium Greenii Porter & Britt.
Lee county. (Baker & Earle.) Mohr's Plant Life.)

Hieracium Gronovii L.
Frequent, dry pine and mixed woods.

Hieracium Marianum Willd.
Occasional, dry hillsides.

Hieracium Scribneri Small.
Tallapoosa county (Mohr's Plant Life).

Hieracium venosum L.
Common, dry rocky wooded hillsides.

Lactuca Canadensis L.
Common, pine woods and open places.

Lactuca Floridana (L.) Gaertn.
Collected once, Auburn.

Lactuca graminifolia Michx.
Occasional, sandy pine woods.

†Lactuca hirsuta Muhl.
Occasional, pine woods.

Lactuca sagittifolia Ell.
Clay county (Mohr's Plant Life).

‡Lactuca villosa Jacq.
Occasional, roadsides.

†Nabalus altissimus (L.) Hook.
Occasional, moist, rich woods, usually creek bottoms.

Nabalus Serpentaria (Pursh) Hook.
Frequent, moist, dry woods, often uplands.

*Nabulus trifoleatus Cass.
Collected once, Auburn, in a garden.

Serinea oppositifolia (Raf.) O. Kuntze.
Occasional, creek bottom fields.

Sitilias Caroliniana (Walt.) Raf.
Common, fields, roadsides and open places. A white flowered form occurs.

Sonchus asper (L.) All.
Frequent, fields and waste places.

Carduaceae.

‡Acanthospermum australe (L.) O. Kuntze.
Frequent, along railroad embankments.

Ambrosia artemisiaefolia L.
Common, fields, etc. (dog weed).

*Antennaria nemoralis Greene.
Frequent, dry rocky hillsides and granite outcrops.

Antennaria plantaginifolia (L.) Richards.
Lee county (Mohr's Plant Life).

Anthemis Cotula L.
Occasional, roadsides and waste places, usually not abundant.

Aster Camptosorus Small.
Common, shaded, rocky hillsides.

Aster concolor L.
Common, dry sandy roadsides and open woods.

†Aster divaricatus L.
Collected once, Clay county.

Aster dumosus L.
Occasional, borders of fields and thickets. ,

Aster ericoides L.
Common, swamps and waste places.

Aster ericoides platyphyllus T. & G.
Lee county. (Baker & Earle.) (Mohr's Plant Life.)

Aster ericoides pilosus (Willd.) Porter.
Common, fields, roadsides and waste places.

*Aster hirsuticaulis Lindl.
Collected once, Auburn.

*Aster ianthinus Burgess.
Collected once, Auburn.

Aster laevis L.
Lee county Mohr's Plant Life).

Aster lateriflorus (L.) Britt.
Common, alder swamps, wet thickets and borders of fields.

Aster oblongiolius Nutt.
Lee county (Mohr's Plant Life).

Aster patens Ait.
Common, roadsides and dry woods, clay land.

Aster puniceus L.
Common, alder swamps and moist thickets.

‡Aster purpuratus Nees.
Frequent, clay roadsides.

Aster sagittifolius Willd.
Collected once, Auburn.

Aster Shortii Hook.
Rocky banks, Tallapoosa river, Elmore county.,

Aster Tradescanti L.
Frequent, moist, shady woods.

‡Aster dumosus cordifolius (Michx.) T. & G.
Very common, dry rocky hillsides. Exceedingly variable. Our collections probably include several of the named varieties.

Aster vimineus foliosus (Ait.) A. Gray.
Lee county (Mohr's Plant Life).

Aster undulatus L.
Common, cultivated fields and waste places.

Bidens frondosa L.
Common, fields and swampy places.

†Brauneria purpurea (L.) Britt.
Collected once, clay roadsides, Chambers county.

Carduus altissimus L.
Common, moist thickets, etc.

*Carduus discolor (Muhl.) Nutt.
Occasional, moist thickets and open woods.

Carduus lanceolatus L.
Clay county (Mohr's Plant Life.)

‡Carduus spinosissimus Walt.
Rare, open sandy land.

Carduus spinosissimus Elliotti (T. & G.) Porter.
Common, old fields, roadsides and open woods, mostly on clay. Worthy of specific rank, often reaches more than three feet in height.

Carduus Virginianus L.
Occasional, sandy roadsides.

‡Chrysogonum Virginicum L.
Occasional, deciduous woods, clay land.

Chysopsis graminifolia (Michx.) Nutt.
Very common, pine and mixed woods, especially on sand.

Chrysopsis Mariana (L.) Nutt.
Common, pine and mixed woods.

Cnicus benedictus L.
Collected once, railroad tracks, Auburn.

‡Coleosanthus cordifolius (Ell.) O. Kuntze.
Occasional, sandy woods and roadsides.

Coreopsis auriculata L.
Common, moist pine and mixed woods, clay or sand.

*Coreopsis bicolor.
Collected once, fields south of Auburn, escaped.

Coreopsis delphinifolia Lam.
Collected once, fields, Chambers County.

Coreopsis grandiflora Hogg.
Locally abundant, moist granite outcrops.

Coreopsis lanceolata L.
Frequent, open pine woods, usually sand.

Coreopsis major Walt.
Common, dry pine and mixed woods.

Coreopsis Oemleri Ell.
Frequent, dry pine and mixed woods. It intergrades freely with the last species and can hardly be considered distinct.

Coreopsis pubescens Ell.
Collected once, Tallapoosa County.

Coreopsis tripteris L.
Occasional, ditch banks and margins of creek bottom fields, clay land.

Coreopsis verticillata L.
Lee county, (Mohr's Plant Life).

‡Doellingeria humilis (Willd.) Britt.
Occasional, creek bottom woods.

†Doellingeria infirma (Michx.) Greene.
Collected once, Lee County; once, Clay County.

Elephantopus Carolinianus Willd.
Frequent, creek bottom woods and thickets, clay or sand.

*Elephantopus elatus Bertol.
Collected once, Auburn; once Macon County.

Elephantopus nudatus A. Gray.
Common, shaded creek bottoms, sandy land.

Elephantopus tomentosus L.
Common, creek bottoms and dryer locations, in shade or exposed, clay or sand.

Erechtites hieracifolia (L.) Raf.
Frequent, rich newly-cleared fields and waste places.

Erigeron annuus (L.) Pers.
Occasional, moist creek bottom fields and waste places.

Erigeron Philadelphicus L.
Collected once, Auburn; moist woods, clay.

†Erigeron pulchellus Michx.
Frequent, rich woods.

†Erigeron ramosus (Walt.) B. S. P.
Common, fields roadsides and waste places.

Erigeron ramosus Beyrichii (F. & M.) Smith & Pound.
Lee county. (Baker & Earle.) (Mohr's Plant Life.)

Eupatorium ageratoides L.
Occasional, creek bottom swamps.

Eupatorium album L.
Common, dry woods, clay or sand.

Eupatorium amoenum Pursh.
Clay county, (Mohr's Plant Life.)

Eupatorium aromaticum L.
Common, dry pine and mixed woods.

Eupatorium capillifolium (Lam.) Small.
Very common, pastures, old fields, roadsides and waste places, usually in moist land.

‡Eupatorium coelestinum L.
Occasional, swamps.

Eupatorium compositifolium Walt.
Frequent, dry old fields and open woods.

Eupatorium cuneifolium Willd.
Frequent, dry sandy pine woods.

Eupatorium hyssopifolium L.
Occasional, dry sandy woods.

Eupatorium linearifolium Walt.
Lee county. (Baker & Earle.) (Mohr's Plant Life.)

Eupatorium perfoliatum L.
Common, swampy places, clay or sand.

*Eupatorium petaloideum Britt.
Collected once, Auburn.

Eupatorium pinnatifidum Ell.
Rare, dry open woods.

Eupatorium pubescens Muhl.
Lee count. (Baker & Earle.) (Mohr's Plant Life.)

Eupatorium purpureum L.
Common, creek bottoms and swamps, especially clay land.

Eupatorium rotundifolium L.
Common, creek bottoms, usually sandy land.

‡Eupatorium semiserratum D C.
Frequent, sandy pine woods.

Eupatorium serotinum Michx.
Occasional, moist roadsides and waste places.

Eupotorium Smithii Greene & Mohr.
Chambers County. (Mohr, Plant Life.)

*Eupatorium Torreyanum Short.
Clay roadsides, Chambers county.

‡Eupatorium tortifolium Chapm.
Frequent, dry sandy pine woods.

Eupatorium verbenaefolium Michx.
Common, swampy woods, sandy land.

‡Gaillardia lanceolata Michx.
Common, open sandy pine woods, etc.

†Gnaphalium Hellleri Britt.
Common, open pine and mixed woods.

Gnaphalium purpureum L.
Common, a winter weed in fields and waste places.

Gnaphalium obtusifolium L.
Lee county. (Baker & Earle.) (Mohr's Plant Life.)

†Gnaphalium Helleri Britt.
Collected once, banks of Tallapoosa river.

Helenium autumnale L.
Common, with the last.

‡Helenium Nuttallii A. Gray.
Frequent, alder swamps and creek bottoms.

‡Helenium tenuifolium Nutt.
Very common, fields, pastures and roadsides; (bitter weed.)

Helianthus angustifolius L.
Common, open swampy places.

Helianthus atrorubens L.
Occasional, roadsides and woods, clay land.

Helianthus divaricatus L.
Frequent, dry woods and roadsides.

Helianthus hirsutus Raf.
Frequent, dry woods and roadsides.

Helianthus hirsutus trachyphyllus T. & G.
Clay county. (Mohr's Plant Life.)

Helianthus microcephalus T. & G.
Common, dry woods and roadsides.

Helianthus Sweinitzii T. & G.
Lee County, (Mohr, Plant Life.)

Helianthus tomentosus Michx.
Frequent, rich mixed woods.

Heliopsis gracilis Nutt.
Occasional, moist upland woods.

Heliopsis helianthoides (L.) B. S. P.
Collected once, Tallapoosa County.

Ionactis linariifolia (L.) Greene.
Common, roadsides and open pine woods, sandy land.

Isopappus divaricatus (Nutt.) T. & G.
Very common, old fields, pastures and roadsides.

Kuhnia eupatorioides L.
Common, dry open woods, usually on sandy land.

*Lacinaria Earlei Greene.
Auburn. (F. S. Earle, 1896.)

‡Lacinaria elegans (Walt.) O. Kuntze.
Locally abundant, sandy pine woods, south of Auburn.

*Lacinaria elegantula Greene.
Auburn. (F. S. Earle, 1896.)

†Lacinaria graminifolia (Walt.) O. Kuntze.
Common, dry pine and mixed woods. A form with white flowers occurs.

†Lacinaria scariosa squarrulosa (Michx.) Small.
Collected once, Auburn.

‡Lacinaria spicata (L.) O. Kuntze.
Occasional, pine woods.

Lacinaria squarrosa (L.) Hill.
Occasional, dry woods.

Leptilon Canadense (L.) Britt.
Common, cultivated fields.

‡Mariana Mariana (L.) Hill.
Collected once, streets of Auburn.

Marshallia lanceolata Pursh.
Frequent, open pine and mixed woods.

Marshallia trinerva (Walt.) Porter.
Occasional, thickets along small streams.

Mesadenia atriplicifolia (L.) Raf.
Banks of Tallapoosa river, Tallapoosa county.

†Mesadenia ovata (Walt.)
Frequent, moist mixed woods.

†Mesadenia renifornis (Muhl.) Raf.
Collected once, Clay county.

Parthemium integrifolium L.
Clay county, Tallapoosa county, Lee county, (Mohr, Plant Life.)

†Pluchea foetida (L.) B. S. P.
Occasional, swamps and creek bottoms.

Pluchea petiolata Cass.
Common, creek bottoms and swamps.

Polymnia Canadensis L.
Clay county (Mohr's Plant Life.)

Polymnia Canadensis radiata A. Gray.
Top of Talladega mountains, Clay county.

Polymnia Uvedalia L.
Occasional, roadsides and moist open woods.

Rudbeckia fulgida Ait.
Frequent, moist upland woods.

Rudbeckia hirta L.
Common, dry open woods.

Rudbeckia laciniata L.
Frequent, creek bottoms and swamps.

Rudbeckia spathulata Michx.
Clay county, Talladega county, Lee county, (Mohr's Plant Life.)

Rudbeckia triloba L.
Collected once, northern Lee county.

Rudbeckia truncata Small.
Collected once, Auburn.

Senecio Earlei Small.
Very common, dry open woods and waste places.

Senecio lobatus Pers.
Very comon, creek bottoms.

Senecio Memmingeri Britt.
Lee county. (Underwood & Earle.) (Mohr's Plant Life.)

Senecio obovatus Muhl.
Lee county. (Baker & Earle.) (Mohr's Plant Life.)

Senecio Smallii Britt.
Clay county, Tallapoosa county, Lee county, (Mohr's Plant

Sericocarpus asteroides (L.) B. S. P.
Common, dry pine and mixed woods.

Sericocarpus bifoliatus (Walt.) Porter.
Occasional, dry sandy pine woods.

Sericocarpus linifolius (L.) B. S. P.
Common, dry pine or mixed woods.

Silphium asperimum Hook.
Clay county. (Mohr's Plant Life.)

Silphium asteriscus L.
Common, upland woods, clay or sand.

Silphium compositum Michx.
Common, upland woods, clay or sand.

Silphium dentatum Ell.
Lee county. (Baker & Earle.) (Mohr's Plant Life.)

Silphium laevigatum Pursh.
Lee county. (Baker & Earle.) (Mohr's Plant Life.)

Silphium trifoliatum L.
Clay county (Mohr's Plant Life.)

†Solidago amplexicaulis T. & G.
Frequent, rocky hillsides, mixed woods.

Solidago arguta Ait.
Clay County. (Mohr, Plant Life.)

Solidago Boottii Hook.
Common, creek bottom woods.

Solidago brachyphylla Chap.
Lee county. (Earle.) (Mohrs' Plant Life.)

†Solidago caesia L.
Common, moist rich woods.

Solidago Canadensis L.
Very common, fields and waste places.

†Solidago erecta Pursh.
Frequent, dry sandy creek bottoms.

‡Solidago fistulosa Mill.
Collected once, Clay county.

Solidago neglecta T. & G.
Lee county. (Baker & Earle.) (Mohr's Plant Life.)

Solidago nemoralis Ait.
Very common, dry roadsides, old fields and dry open second-growth woods.

Solidago odora Ait.
Very common, dry pine and mixed woods.

Solidago pallescens Mohr.
Common, dry rocky hillsides, mixed woods.

Solidago patula strictula T. & G.
Frequent, moist woods, creek bottoms, etc.

Solidago petiolaris Ait.
Common, sandy pine woods.

Solidago rugosa Mill.
Common, creek bottoms, alder swamps.

Solidago salicina Ell.
Lee county (Mohr's Plant Life.)

*Solidago serotina Ait.
Common, creek bottom fields and moist places.

Solidago ulmifolia Muhl.
Common, creek bottom woods.

Solidago Vaseyi Heller.
Clay county (Mohr's Plant Life.)

‡Tetragonotheca helianthoides L.
Common, dry open woods and roadsides, usually sandy land.

Verbesina alternifolia (L.) Britt.
Clay county (Mohr's Plant Life.)

Verbesina aristata (Ell.) Heller.
Common, dry pine and mixed woods.

‡Verbesina Virginica L.
Frequent, dry open creek bottom woods.

Vernonia angustifolia Michx.
Common, sandy pine woods, occasional on clay.

*Vernonia Baldwini Torr.
Collected once, Auburn.

*Vernonia flaccidifolia Small. 1.
Occasional, upland clay woods.

*Vernonia glauca (L.) Britt.
Collected once, Auburn.

†Vernonia maxima Small. 2.
Frequent, alder swamps, etc., reaching 10 or 12 feet.

*Vernonia Noveboracensis (L.) Willd.
Occasional, fields, pastures and roadsides.

*Vernonia ovalifolia T. & G. 3.
Common, dry sandy woods.

Willoughbia scandens (L.) O. Kuntze.
Common, climbing in swamps.

Xanthium glabratum (D C.) Britt.
(=X. strumosum.)

1.—Some of these specimens were at first determined as *Vernonia fascicularis* Michx. and are so reported by Mohr, Plant Life, 758.

2.—This is the Vernonia gigantea (Walt.) Britt, reported from Clay county, Mohr, Plant Life.

3.—Distributed as Vernonia Drummondii.

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ALABAMA.

Agricultural Experiment Station

OF THE

Agricultural and Mechanical College,

AUBURN.

THE COW PEA AND THE VELVET BEAN AS FERTILIZERS.

By J. F. DUGGAR.

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THE COWPEA AND THE VELVET BEAN AS FERTILIZERS.

BY J. F. DUGGAR.

Summary.

This bulletin records the results of more than fifty experiments conducted at Auburn during the past five years, to ascertain the effects of cowpeas and velvet beans in the improvement of the soil. The amount of soil improvement has been determined by the increase in the yields of cotton, corn, oats, wheat and sorghum, grown as first, second, third or fourth crops after the stubble and roots of cowpeas or velvet beans or after vines, stubble and roots of these plants have been plowed under. The basis for determining this increase has been the yield of each crop on plots where no leguminous plant has recently grown.

The fertilizing value of different varieties of cowpeas was found to vary considerably, and is probably in proportion to the luxuriance of growth.

In two tests there was a slightly larger yield of corn from plowing in cowpea vines very late in the fall than from postponing the plowing until April; but it is regarded as generally best to plow in the vines not more than a few weeks before the next crop is planted.

The average for six varieties showed that when cowpeas were at a suitable stage for mowing 36.6 per cent. and in another case 39 per cent. of the dry weight of the plant was available for fertilizing uses in stubble, roots and fallen leaves. In the entire growth of cowpeas on one acre there was contained in one case 53.7 pounds of nitrogen, in another 69.8, and in another 87.2, an average of 70.2 pounds of nitrogen per acre,

which is equivalent to the nitrogen in 1,003 pounds of cotton seed meal.

In the roots, stubble and fallen leaves on an acre there were, respectively, 11.65, 16.2 and 31.4 pounds of nitrogen, an average of 19.75 pounds of nitrogen per acre, which is equivalent to that contained in 282 pounds of cotton seed meal.

The average of three tests shows that 28 per cent. of the total nitrogen was contained in the roots, stubble and fallen leaves after the removal of the hay.

The average increase in the yields of succeeding crops was practically identical whether the fertilizing material was supplied by cowpeas or by velvet beans. Equal areas of these two plants were of practically equal value for soil improvement.

The word vines is here used as synonymous with the entire plant of the velvet bean, and with the entire plant of the cowpea after the pods are picked.

The increase in the yield of seed cotton produced in the year immediately following the plowing in of the vines of cowpeas or velvet beans averaged in four tests 567 pounds per acre, worth (at 6¾ cents per pound for lint and $7.50 per ton for seed) $14.17. The increase in the first cotton crop after the use as fertilizers of the vines of the summer legumes was never less than 32 per cent. and averaged 63 per cent.

In one test with corn the increase in the first crop where velvet bean vines had been plowed in was 81 per cent., of 12.3 bushels, worth at least $6.15 per acre. With oats the average increase from the vines of the summer legumes in three tests averaged 17 bushels per acre, and with wheat the corresponding increase in two tests was 5.65 bushels per acre.

The increase in the yield of sorghum hay after cowpea and velvet bean vines averaged 87 per cent., or an average gain of 2.1 tons of hay per acre, worth, at $6.67 per ton, $14.02.

When the vines of the cowpea or velvet bean were utilized as hay and only the roots and stubble employed as fertilizer the increase in the yield per acre of the crop immediately succeeding the stubble was as follows:

208 pounds of seed cotton, or 18 per cent., worth $5.20.
4.3 bushels of corn, or 32 per cent.;
28 bushels of oats, or 334 per cent.;
6.7 bushels of wheat, or 215 per cent.;
2.08 tons of sorghum hay, or 57 per cent.

The largest *percentage increase* from either the vines or stubble of cowpeas or velvet beans was made by wheat and fall sown oats, probably because these best prevented the washing away or leaching out of the fertilizing material in the stubble or vines of the legumes.

Generally on sandy soil those crops most completely utilize the fertilizing value of the legumes which leave the land unoccupied for the shortest interval. It is generally unadvisable for legumes to immediately succeed legumes in the rotation of crops, for non-leguminous plants like cotton, corn, the small grains, grasses, etc., make better use of the nitrogen of the fertilizing crop.

The *value* of the increased product resulting from the use of the entire legume for fertilizer was greater with cotton and sorghum than with corn, oats or wheat.

These experiments emphasize the importance of such a rotation of crops as will require a large proportion of the cultivated land of every farm to be devoted to some leguminous plant.

Comparing the fertilizing effect of the vines with that of the stubble of the cowpea and the velvet bean, the excess in the next crop in favor of the vines averaged as follows:

6.6 bushels of corn per acre, or.........49 per cent.
.5 ton of sorghum hay, or .... 9 per cent.
452 pounds of seed cotton per acre, or....40 per cent.

With these three crops the average increase in value per acre was $5.98 greater from vines than from stubble. With oats and wheat the vines of these summer legumes were not superior to the stubble when the small grains were sown immediately after the legumes matured.

The fertilizing effect of the *stubble* of cowpeas or velvet beans was very transitory on sandy land, the average increase in the second crop of corn after the stubble being only 1.34 bushels per acre, or 12 per cent., as compared with the yield of a plot that had not borne legumes.

The fertilizing effect of the *vines* of cowpeas and velvet beans was less transitory than that of the stubble, and the increase was 24 to 54 per cent. in the second crop, 14 per cent. in the third crop (oats), and the favorable effect was even perceptible in the fourth crop (sorghum) grown in the same year as the third. The total increase in value of the four crops occupying certain plots during the three years after the plowing under of the vines of cowpeas and velvet beans was $42.97 per acre, an annual increase of $14.32 per acre.

On the other hand, on very light soil the fertilizing effects of both stubble and vines had practically disappeared within twelve months after the plowing in of the legumes.

Corn as the second crop yielded 14 per cent., or 2.1 bushels more after legume vines than after legume stubble, this representing a value of $1.05. The permanency of effect of legumes in soil improvement seems to be in proportion to the stiffness of the soil and to the mass of vegetable matter afforded by the legume, and the favorable influence of leguminous vines is apparently not less permanent than that of stable manure.

INTRODUCTORY.

The improvement of the soil should be one of the chief aims of every farmer. Every increase in productiveness brings an even more marked increase in profits. Given rich soil, and almost any crop will pay if adapted to the local conditions and markets. Labor spent in the cultivation of corn or cotton on extremely poor soil usually earns scant reward or none.

Fortunately much of the poorest worn land can be brought to a fair degree of productiveness. The means of soil improvement are various. Most thoroughly tested by long experience in Europe and America is that system of farming which depends for soil enrichment on the manure from a large number of livestock maintained on the farm, partly for immediate profit, but largely for use as manufacturers of fertilizers. This system should be much more generally followed in Alabama. However, its introduction will be gradual because of limited capital, inexperience, and the small number and poor quality of the native livestock that must serve as a foundation for stock raising.

Meantime the most immediately available method of increasing the fertility of the soils of the South consists in the free use of that class of leguminous plants, or legumes, which embraces cowpeas, velvet beans, soy beans, beggar weed, peanuts, hairy vetch, crimson clover, and numerous others.

When these plants are grown under suitable conditions specific enlargements occur on their roots and these are called root tubercles, or root nodules. The microscopic organisms which live within these tubercles are able to assimilate the nitrogen of the air that circulates through the upper layers of the soil. This nitrogen while a part of the air was useless to plant life, but within the tubercles it is changed into available fertilizer and is carried by the sap to every part of the leguminous plant. Hence we may speak of these tubercles as fertilizer factories where nitrogenous fertilizers are manufactured and whence they are sent to every part of the cowpea or velvet bean, or other leguminous plant. The plowing in of the legume gives this nitrogen to the soil for the use of other plants. Nitrogen when purchased in the form of cotton seed meal costs 12 to 15 cents per pound, but when it is furnished by legumes it is many times cheaper, the principal outlay being for seed and labor.

Great as is the need of the South for varied industrial development, the factories most urgently needed and paying largest dividends are those which every farmer can bring into being by the millions on the roots of such legumes as cowpeas, velvet beans, vetch, crimson clover, melilotus, bur clover, and alfalfa.

These crops afford nitrogen and vegetable matter, thus supplying the principal deficiencies of southern soils, and they may be either used directly and exclusively for this purpose, or with greater profit the tops may first be fed to livestock, thus affording a two-fold profit in animal products and fertilizer, while the stubble and roots are immediately available for soil improvement.

The stubble alone usually causes a sufficient increase in the yield of the following crop to more than pay the cost of seed, fertilizer, and cultivation of the legume, leaving the food value of the tops as a net gain.

The principal part of this bulletin is occupied with data obtained at Auburn during the past five years and bearing on the extent and permanency of the fertilizing effect of cowpeas and velvet beans.

The following conditions prevailed in all of these tests, unless otherwise specifically stated:

The legumes were grown in drills and cultivated and moderately fertilized with acid phosphate or with phosphate and some potash salt. The crops, corn, cotton, oats, wheat, sorghum, and rye, used to measure the fertilizing effects of the legumes, have received no application of nitrogen, but have been fertilized with phosphate and potash.

The soil in all tests is rather poor to extremely poor deep sandy upland, the white or gray being almost a pure sand and the reddish soil approaching a loam with clayey loam subsoil in the latter case.

The vines or stubble of the legumes have been plowed under just before the planting of the next crop.

The variety of cowpeas employed was the Wonderful or Unknown.

In valuing the crops the endeavor has been made to use conservative average prices, the error, if any, being in putting them too low rather than too high. Lint cotton has been rated at 6¾ cents per pound, cotton seed at $7.50 per ton, sorghum hay at $6.67 per ton, corn at 50 cents, oats 40 cents, and wheat 80 cents per bushel. No record is here made of the increase in the yields of grain, straw or corn stover, assmuing that this has been about sufficient to cover the increased cost of harvesting and threshing.

Time to Plow in Cowpea Vines.

On a gray sandy upland soil the vines of drilled cowpeas were plowed under in the late fall of 1898 and 1900, while on other plots plowing was deferred until nearly planting time.

The yields of corn were as follows:

Bushels of corn per acre following cowpea vines plowed under in late fall or early spring.

	Bus. per acre.		
	1899	1901	Av. 2 yr.
Fall plowed	23.8	30.6	27.2
Spring plowed	20.8	29.7	25.3
Difference	3.0	0.9	1.9

The results are slightly in favor of plowing under peavines in the latter part of the fall rather than in spring. As the plots were not strictly uniform, further experiments are needed before definite conclusions can be drawn. It should be said that on July 5, 1899, the foliage of the corn plant was much greener where the vines had been turned under in the fall than on the other plots, though the ears were not discernably different.

It is usually regarded as best to avoid fall plowing on sandy land in the South unless a winter crop is to be grown. On heavy soils where fall plowing may otherwise be desirable, the legumes should first be allowed to mature.

Unless otherwise stated the time of plowing under cowpea and velvet bean vines referred to in this bulletin is a few days or weeks before the planting of the new crop that is to occupy the ground.

Relative Fertilizing Values of Different Varieties of Cowpeas.

Corn was grown in 1898 and 1901 immediately following different varieties of drilled cowpeas which had been picked and in spring the vines plowed under.

Excess of yield of corn in bushels per acre on vine plots as compared in 1898 with no-legumes plot and in 1901 with plot where only pea stubble had been plowed under.

Variety of cowpeas.	1898. Bus.	1901. Bus.
Wonderful (or Unknown)	2.7	0.6
Whippoorwill	2.9	—1.5
Clay	4.3	0.7
Black, from Hastings		—2.9
Red Ripper		5.9
New Era		—3.2
White Giant		0.6
Jones White		1.9
Large White Crowder		5.3
Lady		6.8
Average	3.3	1.4

These figures are given merely as a matter of record, and no conclusions are yet warranted. As a matter of common experience any variety of cowpeas affords in its vines as much or more nitrogen than the following corn crop can utilize. For crops requiring a larger amount of nitrogen or for larger supplies of vegetable matter we may safely value the numerous varieties of cowpeas in proportion to the yeild of hay which they would afford if thus utilized. As noted in Bulletin 118 Wonderful (or Unknown), Clay, and Iron are among the varieties making large yields of hay, and hence of fertilizing material. The Wonderful, by reason of its large yeild, large stems and roots, and varied usefulness, is especially recommended for fertilizing purposes. It is possible, however, that future investigations may show some advantage for varieties that run along the ground and thus by the tangle of runners hold in place on sloping ground in winter a larger proportion of the leaves than is done by an erect variety like Whippoorwill or Wonderful.

Cowpea Vines, Effect on Following Cotton Crop of 1899.

On a reddish loam upland soil of fair quality drilled Wonderful cowpeas and cotton, similarly fertilized were grown in 1898. The peas were picked, yielding 11.8 bushels per acre, and the vines were plowed under the next spring, when both areas were planted with cotton. The corrected yield of cotton in 1899 was 367 pounds, or 32 per cent. greater on the area where the peavines had been plowed in than on the plots where the preceding crop had been cotton.

Cowpea vines, residual fertilizing effect on second crop, viz., oats grown in 1900.—Burt oats were sown in February, 1900, on the same plots as above to test the residual or second-year effects of cowpea vines. On some plots the oats received no nitrogenous fertilizer, on others 76 pounds of nitrate of soda was used per acre.

The yields of oats, in bushels per acre, were as follows:

Fertilizing effects on oats of cowpeas grown two years before.

	After cotton in '98 and '99	After cowpeas in '98 & cotton in '99.	Increase attributable to cowpeas of '98.	
	Bus.	Bus.	Bus.	%
Yield of oats per acre with nitrate of soda..	19.7	25.5	5.8	29
Yield of oats per acre without nitrogenous fertilizer	12.3	22.0	9.7	79

In this case we have an increase of 9.7 bushels, or 79 per cent., as the effect of cowpea vines on oats grown as the second crop after cowpeas. So strong was this fertilizing effect of cowpeas that it was not entirely obscured even when nitrate of soda was also employed, the increase in the yield of oats under these conditions being 29 per cent.

Cowpeas as fertilizer on lime land.—A co-operative fertilizer experiment was conducted for this Station by Capt. A. A. McGregor on lime land at Town Creek, in North Alabama. In his experiment the cowpea was the legume employed.

In 1898 cowpeas were grown on certain plots and cotton on others. The cowpea vines, on which no fruit had matured, were plowed under in the spring of 1899. Cotton was planted on plots which had borne a crop of cotton in 1898 and on others which had grown cowpeas for fertilizing purposes. All cotton plots referred to in this paragraph were unfertilized in 1899, and the fertilization of cowpeas and cotton in 1898 had been identical, only phosphate having been used with either crop.

The weather was exceedingly unfavorable in 1899, so that the full measure of the fertilizing value of cowpeas was not revealed in this test.

In this case the average increase in the yield of seed cotton, which we may attribute to the cowpea vines is, even under very adverse conditions, 58 per cent., or 125 pounds, worth at 2½ cents per pound, $3.92 per acre. Doubtless later crops have also been benefited by the fertilization with cowpeas.

There is reason to expect a larger increase than the above when cowpeas are plowed under on the lime lands of either the Tennessee Valley or of the Central Prairie Region of Alabama. Especially in the prairie soils the principal need is for vegetable matter to lighten the soil and to add nitrogen, and for these purposes the choice must usually be made between melilotus (the so-called lucern) and cowpeas.

Fertilizing Effects of Vines of Cowpeas and Velvet Beans as Shown by Sorghum in 1897.

In 1897 sorghum was grown on three plots following, respectively, velvet bean vines plowed under, cowpea vines plowed under, and fallow, or clean cultivation without crop in 1896.

In 1897 the yields of sorghum hay per acre were as follows:

	Yield.	Increase	
	Lbs.	Lbs.	%
After fallow	3,792		
After cowpeas, plowed in	7,008	3,216	85
After velvet beans, plowed in..........	7,064	3,272	86

The effect of the legumes was to nearly double the crop of sorghum hay.

Fertilizing Materials in Leaves, Stems, and Roots of the Cowpea.

In September, 1899, just 81 days after the planting of the seed, samples were taken of six varieties of cowpeas growing in 34-inch drills on poor gray sandy land. The sample in each case comprised the entire growth on a measured area of land, including the roots growing in the upper 6 inches of soil, which stratum contained nearly all the roots.

After curing, the leaves, blooms and pods, coarse stems ,fine stems (including runners, leafstalks, etc.), fallen leaves and leafstalks,and roots with attached stubble about two inches long, were carefully separated. Analyses were made in the chemical department of a composite sample representing all six varieties, the material analyzed being extremely dry. (For analysis of same samples showing food value see Alabama Station Bulletin No. 118, page 37.)

The following table shows what percentage of the total air-dry weight of the plants of each variety was available for fertilizing purposes after the removal of the hay.

Per cent. of the entire weight of the cowpea plant in stubble and roots and in fallen leaves and leaf stalks.

Variety.	Fallen leaves, etc.	Roots and 2-inch stubble.	Total.
	%	%	%
Miller	17.7	25.0	42.7
Whippoorwill	3.7	21.6	25.3
Iron	15.4	19.0	34.4
Wonderful	19.2	20.3	39.5
Jones White	14.3	14.5	28.8
Clay	22.9	26.0	48.9
Average, 6 varieties	15.5	21.1	36.6

The average for the six varieties shows that in each 100 pounds of dry plants there were 15.5 pounds of fallen leaves and leaf stalks, and 21.1 pounds of roots and stubble, making a total of 36.6 pounds, more than one-third of the entire plant being thus left on the ground for fertilizer after the hay was cut.

Analyses of the different parts of the plant made by Prof. C. L. Hare, of the chemical department of this station, are recorded in the following table.

Composition of parts of the air-dry cowpea plant.

	Water.	Nitrogen.	Phosp'ric Acid.	Potash.
	%	%	%	%
Leaves	10.65	3.59	.78	1.49
Fine stems	8.97	1.90	.64	.68
Coarse stems	8.47	1.51	.42	1.49
Fallen leaves and leaf stalks	9.75	1.67	.37	1.09
Roots and 2-inch stubble	5.25	1.38	.26	1.11

Let us direct our attention to the nitrogen, since this is the only one of the three precious elements that the plant obtains (in part) from the air, and the only one in which the soil is enriched by the growing of cowpeas. The growing leaves in the air-dry condition contain nearly twice as large a percentage of nitrogen as the fine stems, and more than twice as much as the coarse stems and roots and fallen material.

Amounts of air-dry material and nitrogen afforded by different parts of the cowpea plant on one acre (average of six varieties)

	Air dry material.	Nitrogen.
	Lbs.	Lbs.
In leaves retained on vines	501.0	18.00
In fine stems	401.6	7.66
In coarse stems	438.8	6.61
In pods, blooms, etc	325.0	*9.75
In fallen leaves and leaf stalks	357.3	5.97
In roots and 2-inch stubble	411.7	5.68
Total	2435.4	53.67

*Assuming 3% of nitrogen in thoroughly air-dry pods.

The amount of nitrogen stored up by a poor crop of cowpeas growing on an acre, 53.67 pounds, is equivalent to that contained in 767 pounds of cotton seed meal. It should be remembered that an undetermined portion of this nitrogen came from the soil, though on a soil as poor as this the nitrogen derived from the air probably constituted by far the larger portion of the total nitrogen utilized by the plant.

In the stubble, roots, and fallen material there was 11.65 pounds of nitrogen per acre or the same amount as is contained in 162 pounds of cotton seed meal.

Of the total nitrogen in the entire plant 22 per cent. was found in the roots, stubble and fallen material.

An experiment somewhat similar to the preceding was made in 1909, using only a single variety, Wonderful or Unknown. The seed were planted in drills 2½ feet apart on poor gray sandy soil. Four samples were taken from two plots, each sample consisting of the entire growth on an area of four square yards; the roots were obtained by digging and sifting the soil to a depth of six inches, to which stratum all the principal roots were apparently confined.

That the samples were accurately taken is indicated by the close agreement of the duplicate samples; hence only average results are given below. The vines were cut, the fallen leaves and leaf stalks collected, and the roots sifted out on September 5. This was 106 days after the date of planting on one plot and 78 days after planting on the other.

When harvested the more mature sample was slightly past its prime for hay, as shown by the unduly large amount of fallen leaves, while the other sample was too immature and succulent for easy curing.

The yields per acre of extremely dry hay according to the weight of the samples taken after being stored in an office for seven months, were 2,269 pounds on the plot cut at a late stage, and 2,087 pounds of the less mature material. These are equivalent to about 1¼ and 1⅛ tons per acre of cowpea hay with the usual amount of moisture.

Weights (air-dry) per acre of hay, roots, and stubble, and fallen leaves of the cowpea.

	Air dry material, per acre.	
	Ripening stage.	Blooming stage.
	Lbs.	Lbs.
Vines, including stems, leaves, pods, etc	2,269	2,087
Roots, and stubble about 2 in. long...	714	502
Fallen leaves and leaf stalks	1,385	804
Total..............................	4,368	3,393

The following table shows what proportion of the entire plant consisted of roots, fallen material, and hay, in the plants harvested when ripening or when in bloom.

	Ripening stage.	Blooming stage.
	%	%
Tops	52	61
Roots and stubble	16	15
Fallen leaves, etc	32	24

When hay was made of cowpeas past their prime there was left on the ground in roots, stubble, and fallen material 48 per cent. of the weight of the plant, and when mowing occurred when the vines were in bloom 39 per cent. of the total weight remained as fertilizer material.

Analyses made by Prof. J. T. Anderson, Associate Chemist of this Station, are recorded below:

Composition of hay, fallen material, and roots and stubble of the cowpea.

	Water.	Nitrogen.	Phosph'ric Acid.	Potash.
In ripening stage:	%	%	%	%
Hay	9.05	2.46	.85	2.14
Fallen leaves and leaf stalks	7.80	1.83	.64	1.45
Roots and stubble	7.77	1.17	.48	1.51
In blooming stage:				
Hay	8.15	2.57	.81	2.86
Fallen leaves, etc.	6.80	1.36	.59	1.15
Roots and stubble	7.00	1.05	.41	2.11

From this table it may be seen that the hay is more than twice as rich as the roots and stubble in nitrogen, and also richer in phosphoric acid and potash.

The amounts of nitrogen contained in the hay, fallen material, and roots and stubble on one acre were as follows:

	Ripening stage. Lbs. nitrogen.	Blooming stage. Lbs. nitrogen.
In hay	55.8	53.6
In fallen leaves, etc	23.1	10.9
In roots and stubble	8.3	5.3
Total per acre	87.2	69.8

The total amounts of nitrogen stored up by the cowpea plant on one acre was in one case 87.2 pounds, in the other 69.8 pounds, equivalent, respectively, to the nitrogen in 1,246 and 997 pounds of cotton seed meal.

Of this amount there was left in and on the soil when mowing occurred late 31.4 pounds of nitrogen; and from the younger plants 16.2 pounds per acre. This is equivalent to the statement that the nitrogen per acre remaining after the vines were removed was equal to the amount contained in 446 or 231 pounds of cotton seed meal.

Of the total nitrogen in the plant, the roots, stubble, and fallen material contained 34 per cent. at the ripening stage, and 23 per cent. at the blooming period.

Considering the three tests together the total amounts of nitrogen per acre of cowpeas was 70.2 pounds in the entire growth, of which the average amount in the stubble was 19.75 pounds, or 28 per cent.

Cowpea Stubble versus Cowpea Vines as Fertilizer for Corn in 1901.

Corn was grown in 1901 on sandy loam land, which, in 1900 had borne a light crop of drilled cowpeas, planted after the removal of the oat crop of 1900.

Three plots were employed. On one the peavines had been cut the previous September, yielding 1,648 pounds of hay per acre. On the other two plots no vines nor peas were harvested but the entire growth, which was only about half of a normal yield, was plowed under March 14, at which time the stubble plot was also plowed.

On the stubble plot and on one of the others corn was fertilized with 100 pounds of acid phosphate per acre, which fertilizer was omitted from the third plot. The stand was uniform. The yields of corn in bushels per acre were as follows:

	Bus.
Pea stubble and phosphate as fertilizer	11.40
Pea vines and phosphate as fertilizer	20.28
Pea vines as fertilizer, no phosphate	21.74

The yield of corn following pea vines was 78 per cent. greater than the yield on the plot where the stubble only had been plowed under, the increase being 8.88 bushels per acre.

In the presence of a considerable amount of rich vegetable matter furnished by pea vines, phosphate was not needed on this soil where acid phosphate had been applied annually for many years.

In a different field on more permeable gray sandy soil corn grown in 1901 on a plot where the stubble of Wonderful cowpeas had been plowed under for hay yielded 25.3 bushels per acre. The average yield of corn on two adjacent plots—where cowpea vines of the varieties Lady and White Giant, both luxuriant growers, had been plowed under, was 25.9 bushels per acre. Here there was practically no superiority of vines over stubble as a fertilizer for corn.

Note should also be taken of the increase in the corn crop due to plowing in either stubble or vines of a number of varieties as recorded in the table on page 131.

Velvet Bean Stubble and Vines as Fertilizers for Corn in 1901.

The fertilizing effect of velvet bean stubble, of velvet bean vines, and of velvet bean vines in connection with acid phosphate, was tested in 1901 on four plots of very poor, deep white sandy soil. On one plot the proceding crop had been corn. On the other three plots drilled velvet beans planted June 13, after the harvesting of the oat crop, had made only a moderate growth in 1900. On one of these plots the velvet bean vines were cut September 10, 1900, yielding 3,632 pounds of hay per acre.

On the other two plots the vines were left on the land all winter. In the latter part of the winter all four plots were plowed, a disc harrow having first been run over the field while the vines were frozen in order to cut them and thus render it easier to plow them in.

The corn on three of the plots was fertilized with 100 pounds of acid phosphate per acre, but this fertilizer was omitted on one of the plots where velvet bean vines had been plowed in.

Yield of corn in 1901 following corn, velvet bean stubble, or velvet bean vines.

	Bus.
Phosphate (but no legume), as fertilizer......	13.58
Velvet bean stubble and phosphate as fertilizer..	17.93
Velvet bean vines and phosphate as fertilizer...	25.90
Velvet bean vines (no phosphate), as fertilizer..	21.48

The increased yield per acre, as compared with the yield on the plot on which the previous crop had been corn, was 4.35 bushels, or 32 per cent., with velvet bean stubble, and 12.32 bushels, or 81 per cent., with velvet bean vines.

The increase attributable to 100 pounds of acid phosphate was 4.42 bushels, which made the use of this mineral fertilizer decidedly profitable for corn on very poor white sandy soil, when used in connection with a large mass of rich vegetable matter. On the other hand, on a spot about 100 yards distant, where the soil was less sandy and in better condition, phosphate did not increase the yield of corn when added to pea vines plowed under. (See page 140.)

Immediate Fertilizing Effect on Sorghum of Cowpea and Velvet Bean Vines and of Cowpea and Velvet Bean Stubble.

The soil on which the following experiment was made is a sandy loam, containing many small flint stones, and underlaid by a stiffer subsoil.

In 1898 eight uniform plots were planted, 2 plots with velvet beans, 5 with Wonderful cowpeas (most plots broadcast), and 1 with drilled Orange sorghum. The growth of the several plots was either cured for hay or used as a fertilizer, as indicated in the next table.

March 9, 1899, all plots were plowed and in due time sorghum was planted in drills on all plots, and the two cuttings of this crop at the proper season were cured for hay.

The yields per acre of sorghum hay at two cuttings, the first growth having become too coarse, but the second being of good quality, averaged as follows:

First year effects on sorghum of stubble or vines of cowpeas or velvet beans.

	Yield per acre.	Increase from legumes.
	Tons.	Tons.
Sorghum hay after sorghum stubble..	3.65	
Sorghum hay after cowpea stubble..	5.66	2.01
Sorghum hay after velvet bean stubble	5.80	2.15
Sorghum hay after cowpea vinc, pckd	5.72	2.07
Sorghum hay after velvet bean vines	6.76	3.11

As a fertilizer for sorghum velvet bean vines proved superior to cowpea vines, and to velvet bean stubble.

The stubble of cowpeas and of velvet beans was of practically equal fertilizing value.

Residual fertilizing effect of legumes on corn grown as the second crop after cowpea and velvet bean vines and cowpea and velvet bean stubble.

March 17, 1900, the sorghum stubble in the experiment just discussed was turned with a one-horse plow and March 29 corn was planted on all plots.

"Fertilizing effects in 1900 of stubble and vines of cowpeas and velvet beans grown in 1898.

Plot.	Crop in 1898.	Portion used for fertilizer.	Corn per acre in 1900.		
			Yield.	Increase over sorghum plot of 1898.	Increase, vines over stubble.
			Bus.	*Bus.*	*Bus.*
8	Sorghum. . .	Stubble.	24.1	. . . .	. . . .
4 & 7	Cowpeas.	Stubble	25.7	1.6	. . . .
3 & 6	Cowpeas	Vines after picking	27.7	3.6	2.0
2	Velvet beans.	Stubble.	23.9	0.2	. . . .
1	Velvet beans.	Entire growth.	26.8	2.6	2.4

Let it be noted that the heavy growth of sorghum in 1899 did not utilize all of the fertility derived from the preceding crop of legumes. Although sorghum is a plant that is especially exhaustive to soil fertility, there still remained for the corn crop of 1900 a residue of nitrogen from the cowpea and velvet bean vines of 1898 sufficient to increase the yield of corn to the extent of 3.6 bushels per acre where cowpeas had grown two years before, and 2.6 bushels where velvet beans had grown. This is an average of 3.2 bushels per acre as the residual fertilizing effect of these legumes.

The fertilizing effects of the stubble and roots of these two plants was far more transitory, the first succeeding crop, sorghum, practically exhausting them, leaving sufficient in the soil to increase the corn crop of 1900 by only an inconsiderable amount, viz.: 1.6 bushels and .2 bushel, an average of .9 bushel per acre." (From Bulletin No. 111, Alabama Experiment Station.)

Immediate Fertilizing Effect on Corn in 1900 of Cowpea and Velvet Bean Vines.

This experiment was made on a white, sandy soil, poorer than that used in the last mentioned experiment. In the late spring and early summer of 1899 velvet beans had been planted in drills on certain plots and beggar weed had been sown broadcast on others. The beggar weed and a portion of the velvet beans was used exclusively for fertilizer. On other plots velvet beans were cut, thus leaving only the stubble as fertilizer for corn.

"These various fertilizing materials were all plowed under March 31, 1900, and Mosby corn planted April 5, using per acre 240 pounds of acid phosphate and 40 pounds of muriate of potash.

Vines versus stubble of velvet beans as fertilizer for corn in 1900.

Plots.	Material used for green manuring.	Yield of corn per acre.	Increase over stubble plot.
		Bus.	Bus.
4 & 9	Stubble of velvet beans	15.6	
3 & 8	Entire growth of velvet beans	27.5	11.9
2 & 7	Entire growth of beggar weeds........	18.7	3.1

The entire growth of velvet beans afforded a yield of corn greater by 11.9 bushels per acre, or 76 per cent., than the yield where only the stubble was employed as fertilizer." (Alabama Station Bulletin No. 111.)

Residual fertilizing effects of velvet bean vines and stubble on the second crop of corn grown in 1901.

The same poor, white, sandy hilltop was again planted in corn in 1901 without any nitrogenous fertilizer. The yield of corn per acre were 15 bushels where velvet bean vines growing in 1899 had been plowed under and only 11.1 bushels where velvet bean stubble had been turned under at the same time. The residual or second-year fertilizing effect of the vines was greater than that of the stubble by 3.9 bushels per acre, or 33 per cent.

The total fertilizing value of the vines during the two seasons following the date when they were plowed in exceeded that of the stubble to the extent of 59 per cent., or 15.8 bushels of corn per acre. This amount of corn would usually be worth more than the net value of the 2,800 pounds of velvet bean hay obtained from the stubble plot at considerable expense for curing.

In this case it was more profitable to plow under velvet bean vines for fertilizer than to harvest them for hay. Judging from other corresponding tests it would have been still more profitable to have grazed cattle on the vines, either in their green or winter-killed condition.

Cowpea and Velvet Bean Vines, Immediate Fertilizing Effects on Cotton Grown in 1899.

In 1898 on a reddish loam soil, abounding in flint stones and underlaid by a red loam subsoil there were grown on adjacent plots cowpeas, velvet beans, and cotton, all fertilized alike with acid phosphate and kainit. The cowpeas and velvet beans were planted thickly in drills, using per acre 112 pounds of cowpeas and 120 pounds of velvet beans. The variety of cowpeas used was the Unknown or Wonderful. Both cowpeas and velvet beans were picked and removed from the field, though the latter did not fully mature. The vines were turned under in March, 1899, and all plots were planted to cotton; each plot of cotton was fertilized at the rate of 240 pounds of acid phosphate and 96 pounds of kainit per acre.

The yield of seed cotton per acre in 1899 was 1,533 pounds following cowpeas, 1,373 pounds following velvet beans, and 837 pounds following cotton.

These figures show that the increased yield of seed cotton attributable to manuring with cowpea vines was 696 pounds per acre; the gain apparently due to the fertilization with velvet beans was 546 pounds per acre. In percentages the increase is 83 and 64 per cent., respectively. Valuing seed cotton at 2½ cents per pound (which is equivalent to 6¾ cents per pound of lint and $7.50 per ton of seed), the gain with cowpeas and velvet beans is worth, respectively, $17.40 and $13.65 per acre.

Surely it was more profitable to grow cotton every alternate year at the rate of a bale per acre than to grow continuous cotton crops of about one-half bale per acre. Additional proof of this is found in the fact that one of these plots afforded in 1898 a yield of 18¼ bushels of cowpeas per acre, besides increasing the cotton crop of the following year to the extent of $17.40 per acre.

Residual fertilizing effects of cowpeas and velvet beans on sorghum, oats, and late sorghum grown as second, third and fourth crops after these legumes.

These same plots were planted with drilled sorghum without any nitrogenous fertilizer in April, 1900; with red oats without nitrogenous fertilizer in November, 1900, and again with drilled sorghum without any nitrogenous fertilizers, July 18, 1901.

Fertilizing effects of cowpeas and velvet bean vines grown in 1898 on sorghum in 1900 and as a second crop in 1901.

Preceding crop.	Sorghum hay per acre, 1900.	Sorghum hay per acre, 1901.	Total increase after legumes.
	Tons.	Tons.	Tons.
Cotton in '98 and '99	5.1	1.0	
Cowpeas in '98 (picked), and cotton in '99	8.1	1.5	3.5
Velvet beans in '98, and cotton in '99	8.2	1.6	3.7

As compared with the plot not recently in legumes the increase of sorghum hay per acre in 1900 from cowpeas grown two years before was 3 tons per acre, or 59 per cent.; from velvet beans two years before the increase in 1900 was 3.1 tons of hay, or 61 per cent.

The increased yield with late sorghum, which was the fourth crop after the plowing in of the vines of the legumes, was, after cowpeas, .5 of a ton, and after velvet beans .6 of a ton. In the two sorghum crops the total increase in yield attributable to legumes was, with cowpeas, 3.5 tons of hay, and with velvet beans 3.7 tons of sorghum per acre.

Now let us go back a few months and note the yield of the oat crop coming between the sorghum crops of 1900 and 1901.

Yield of oats in 1901 grown as the third crop after legumes.

Preceding crops:	Yield, oats per acre.	Increase after legumes.	
	Bus.	Bus.	%
Cotton in '98; cotton in '99; sorghum in 1900	23.3		
Cowpeas in '98; do do	26.5	3.2	14
Velvet beans in '98; do do	37.2	13.9	59

The fertilizing effect of the legumes was apparent in the third crop after the legumes, the increase where cowpeas had once grown being 3.2 bushels of oats per acre, or 14 per cent. The increase where velvet beans had been is suspiciously large, and in subsequent calculations it will be assumed that the increase in the yield on this plot if not influenced by accidental conditions would have been no greater than that on the plot once in cowpeas, viz., 3.2 bushels per acre.

Financial results of using cowpea vines as fertilizers for cotton, sorghum, oats, and late sorghum.

Let us convert these yields of cowpeas, cotton, sorghum, and oats into their money values to learn whether the introduction of cowpeas or velvet beans into the rotation has been profitable.

Value of crops per acre in three years (1) following cotton and (2) following cowpea vines.

	Value of crops per acre in			
	1899.	1900.	1901.	Total for 4 crops in 3 years.
Plot 3—No legume in 5 years:				
In '99, 837 lbs. seed cotton, at 2½c*	$20.92			$69.93
In '00, 5.1 tons sorghum hay, at $6.67 per ton		$33.02		
In 1901, 23.3 bus. oats, at 40c....			$9.32	
In 1901, 1 ton sorghum hay			$6.67	
Plot 1, cowpeas in '98, picked and vines plowed under:				
In '99, 1,533 lbs. seed cotton at 2½c	$38.30			$112.90
In 1900, 8.1 tons sorghum hay....		$54.00		
In 1901, 26.5 bus. oats, at 40c....			$10.60	
In 1901, 1.5 tons sorghum hay			$10.00	
Difference in 3 years				$42.97
Average difference per year peracre				$14.32

*Equal to 6¾ cents per pound of lint, and $7.50 per ton of seed.

The total value of the products grown in three years on an acre was $69.93 on the plot where no legume had been grown for many years and $112.90 per acre on the plot where one crop of cowpeas had been grown once in four years, and where the vines, after the picking of the peas, had been plowed under at the beginning of the three-year period under consideration. The difference in the value of the crops for three years is $42.97; the average annual difference is $14.32 per acre in favor of the plot where cowpeas had been grown

The figures showing the financial advantages of using one crop of velvet beans for fertilizer during the same period so nearly correspond with those for cowpeas that the calculation need not be repeated.

On this land the plowing under of the vines of the cowpeas and velvet beans was exceedingly profitable. The soil of these plots is a reddish, clayey loam, stiffer and probably more retentive of fertilizer nitrogen and humus than the greater portion of the soil on the Station Farm.

Lest any should misapprehend the lessons of this experiment it is necessary to state that at no time in the three-year period was any nitrogenous fertilizer applied to any crop on any of these plots, but that each crop was supplied with phosphate and potash.

The yearly application of cotton seed meal would have lessened the differences between the plots, as it has done in our unpublished rotation experiments, and would have made the advantage in favor of legumes less striking than in the exhibit above.

Immediate Fertilizing Effects on Cotton of Velvet Bean Vines.

On poor soil at Auburn an effort was made in 1898 and 1899 to ascertain the manurial value of the vines and stubble of velvet beans.

In 1898 cotton was grown on certain plots and velvet beans on others. The fertilization of all plots in 1898 was not identical, but for a given fertilizer applied to cotton there was a plot of velvet beans receiving the same fertilizer. The velvet beans grew in drills 3½ feet apart; the vines formed a dense mat of vegetation, but did not mature seed. In March, 1899, velvet beans and cotton stalks were plowed in and soon afterwards all plots were fertilized alike with a mixture of 240 pounds of acid phosphate and 40 pounds of muriate of potash per acre.

Russell cotton was planted in 3½ feet drills on all plots on April 21. From midsummer forward there was a remarkable difference in the appearance of the two sets of plots, the cotton plants being much larger, greener, and more luxuriant on the plots where velvet beans had grown the year before.

Av. yield of seed cotton per acre following velvet bean vines	1,578 lbs.
Av. yield of seed cotton per acre following cotton	918 lbs.
Increase from velvet bean vines.......	660 lbs.

The average increase attributable to velvet beans used as a fertilizer was 660 pounds of seed cotton per acre, a gain of 72 per cent. as compared with the average yield on plots where the preceding crop had been cotton. At $2\frac{1}{2}$ cents per pound of seed cotton (equivalent to $6\frac{3}{4}$ cents per pound for lint and $7.50 per ton for seed) this increase is worth $16.50 per acre.

Residual fertilizing effects on corn of velvet bean vines.

The residual ,or second-year, effects were tested on corn planted on these plots March 29, 1900, without nitrogenous fertilizer.

Where cotton had grown in 1898 the yield of corn in 1900 was 18 bushels per acre; on the next plot, where velvet beans had been grown for fertilizer in 1898, the yield of corn in 1900 was 25.5 bushels. This gain of 7.5 bushels per acre, or 42 per cent., represents the residual or second-year effect of using the entire growth of velvet beans as a fertilizer.

Immediate and Residual Effects of Velvet Bean Stubble on Cotton and Corn.

In the same field the velvet beans on one plot were cut for hay October 12, 1898. The stubble and roots were plowed in at the same time as the vines on the other plots referred to above.

Cotton on the plot where only roots and stubble were plowed in yielded in 1899 1,126 pounds of seed cotton per acre, an increase when compared with the plots where cotton had grown the previous year of 208 pounds, or 49 per cent.

Comparing velvet bean vines with velvet bean stubble the difference in favor of the vines was 452 pounds of seed cotton per acre in the first crop.

Corn in 1900 on this plot yielded 14 per cent., or 2.6 bushels per acre more than did corn on the nearest plot where in 1898 cotton instead of velvet beans had grown. As the stubble plot was slightly lower down on the hillside we suspect that the increase was partly due to this disturbing condition and not wholly to the residual effects of the velvet bean stubble of 1898.

It was on this stubble plot that in 1898 the velvet bean hay (8,240 pounds per acre) contained 188.7 pounds of nitrogen and the roots and stubble and fallen leaves only 12.5 pounds of nitrogen per acre. (See Alabama Station Bulletin, No. 104, page 336.)

Immediate Fertilizing Effects of Cowpeas on Oats in 1897.

"On sandy soil in 1896 several plots were sown broadcast with the Wonderful variety of cowpeas, and an adjacent plot was sown broadcast with German millet. The German millet was plowed under, as were also the peavines, the peas having been previously picked.

February 18, 1897, Red Rust Proof oats were sown after the above mentioned crops, using in both cases 100 pounds of acid phosphate and 80 pounds of nitrate of soda per acre.

After cowpeas the oat straw grew to be three to four inches taller than on the plot preceded by German millet. The yields were as follows:

Oats following cowpeas and German millet, 1897.

	Yield per acre.	
	Bus. Grain.	Lbs. Straw.
Oats after cowpeas, vines plowed under.....	22.8	788
Oats after German millet, plowed under.....	12.4	559
Difference per acre	10.4	229

In this case cowpeas were more valuable than German millet as fertilizer for the following oat crop, the difference in favor of cowpeas being 10.4 bushels of oats per acre and 229 pounds of straw." (From Bulletin No. 95, Alabama Experiment Station.)

This is an increase of 84 per cent. in grain.

Immediate Fertilizing Effect of Cowpea and Velvet Bean Vines and Stubble on Oats in 1898.

This experiment is descibed in the following quotation from Bulletin No. 95 of this Station:

"May 14, 1897, on poor sandy soil Wonderful cowpeas were sown on two plots, velvet beans on two plots, and German millet on a fifth plot. A sixth plot was prepared and fertilized but left without seed, to grow up in crab grass, poverty weed, etc. Cowpeas and velvet beans were sown in drills two feet apart, German millet broadcast. The millet was cut for hay July 16, yielding 994 pounds per acre. The cowpeas on one plot were picked September 10, yielding 11 bushels per acre.

The velvet beans did not mature seed.

In September, 1897, cowpeas on one plot and velvet beans on one plot were cut for hay and the stubble plowed under. The vines of cowpeas on one plot and of velvet beans on another were also plowed under on the above mentioned date. Then oats were sown at a uniform rate on all four plots, also on the plot where the German millet stubble had been plowed under and on the one where crab grass and various weeds had just been buried by the plow.

On all plots oats were fertilized with 220 pounds per acre of acid phosphate and 44 pounds of muriate of potash, no nitrogen being supplied except that contained in the remains of preceding crops of cowpeas, velvet beans, etc.

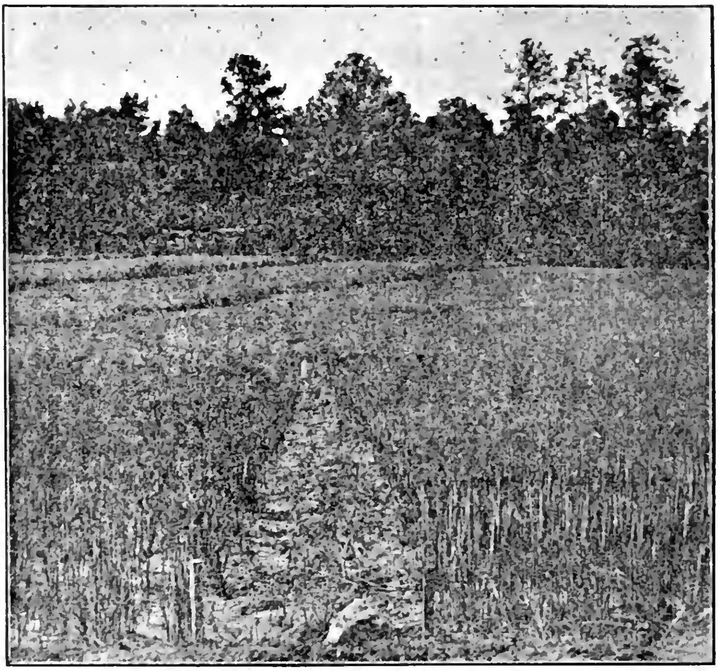

FIGURE 1. Oats following cowpea stubble on the right; on the left oats after crabgrass.

Yield per acre of oats grown immediately after stubble or vines of cowpeas, velvet beans, etc.

Plot No.		Yield per acre.	
		Grain.	Straw.
		Bus.	Lbs.
1	Oats after velvet bean vines..................	28.6	1206
6	Oats after velvet bean stubble..............	38.7	1672
	Average after velvet bean vines and stubble	33.6	1439
4	Oats after cowpea vines	28.8	1463
3	Oats after cowpea stubble	34.4	2013
	Average after cowpea vines and stubble....	31.6	1738
2	Oats after crab grass and weeds	7.1	231
5	Oats after German millet	9.7	361
	Average, after non-leguminous plants......	8.4	296

From early spring there was a marked difference in the appearance of the several plots, the plants being much greener and taller where either the stubble or vines of cowpeas had been plowed under.

When the oats began to tiller, or branch, the difference increased, the plants supplied with nitrogen, through the decay of the stubble or vines of cowpeas and velvet beans, tillering freely and growing much taller than the plants following German millet or crab grass. The difference in the height and thickness of the oats on some of the plots is shown in figures 1 and 2.

May 18, 1898, oats on all plots were cut.

In this experiment the average yield of oats was 33.6 bushels after velvet beans, 31.6 bushels after cowpeas, and only 8.4 bushels after non-leguminous plants (crab grass, weeds and German millet.)

Here is a gain of 24.2 bushels of oats and nearly three-fourths of a ton of straw as a result of growing leguminous or soil-improving plants, instead of non-leguminous plants, during the preceding season.

Undoubtedly this is an extreme, and not an average, case. If cotton seed meal, or other nitrogenous fertilizer, had been used on all the plots of oats, the plants on plots 2 and 5 would have made better growth, and the difference in favor of the leguminous plants would have been reduced.

A gain of five to fifteen bushels of oats per acre as a result of plowing under cowpea stubble or vines would make the growing of cowpeas for fertilizer a profitable operation, and it is far safer to count on such an increase as that obtained in our first experiment (10.4 bushels), rather than to expect such an exceptional increase as that obtained in this last experiment.

An unexpected result of this experiment is the larger crop on the plots where only the stubble was left than on those where the vines of cowpeas and velvet beans were plowed under. The plots were of nearly uniform fertility, as judged by the location and by the uniform growth of cotton on all plots in 1896. While admitting the possibility that the two west plots (plots 3 and 6) were slightly richer than the two on the east (plots 1 and 4), the writer thinks that the difference in yield was almost wholly due (1) to the fact that the vines (especially those of the velvet beans) were not properly buried by the small plow employed, and (2) that the seed bed for oats was more compact where only stubble was plowed under, a point of advantage, doubtless, in such a dry winter as that of 1897-98. It does not follow that the land will be permanently benefitted by cowpea stubble to a greater extent than by cowpea vines. The reverse is probably true." (From Bulletin No. 95, Alabama Experiment Station.)

Residual fertilizing effect on late corn of cowpea and velvet bean vines and stubble.

On June 20, 1898, or a month after the harvesting of the oats in the last mentioned experiment, all six of these plots were planted in corn without nitrogenous fertilization, which crop, as usual with very late corn on poor upland, was a failure.

The yields were as follows:

Yields of late corn grown as the second crop after legumes.

Crop in 1897:	Yield per acre.	Increase after legumes.
	Bus.	
Crab grass, plowed in	4.3	
German millet, stubble plowed in	7.3	
Cowpeas, stubble plowed in	6.2	.4
Velvet beans; stubble plowed in	7.7	1.9
Cowpeas, picked; vines plowed in	6.7	.9
Velvet beans; vines plowed in	7.9	2.1

The fertilizing effects of both stubble and vines of cowpeas was scarcely perceptible in the late corn planted eight months after and harvested thirteen months after the plowing under of the large amounts of nitrogen furnished by the legumes. Apparently the crop failure was not due to deficient rainfall, for this was ample except for about two weeks about the middle of August. The small size of stalks leads to the suspicion that there was a deficiency of nitrogen on all plots. If this nitrogen was lost by being leached out in the draining water this loss must have occurred almost entirely after corn was planted or in July and August; for in 1898 April, May, and June were unusually dry months. On the other hand there was a period of excessive rainfall July 4 to 11 and of still greater excess July 28 to August 6. During this latter period 7.59 inches of rain fell in a space of ten days.

The experiment seems to teach that on very light, gray, sandy upland, subject also to surface washing, the fertilizing effects of even large amounts of nitrogen furnished by preceding crops of legumes may be removed from the soil within twelve months after the legume has been plowed in. The lesson might also be drawn that on such soils the planting of any non-leguminous crop after small grain is risky, but that if such a crop is employed the seed should be put into the ground as soon as possible after the removal of the grain crop.

An experience like this in which the fertilizing effect of the entire or nearly entire growth of the legume was no greater than that of the stubble on either the first or on the second succeeding crop emphasizes the wisdom of utilizing the vines of cowpeas, etc., for food, leaving only the roots and stubble to fertilize the next crop.

Immediate Fertilizing Effect on Wheat of Cowpea and Velvet Bean Vines and Stubble.

All the plots of the last mentioned experiment were in oats from February to June, 1900.

June 23, 1900, certain plots were planted with drilled cowpeas, certain others with drilled velvet beans, and yet others were merely plowed and fertilized with minerals, as were the legumes.

Of the two plots of cowpeas, one was cut for hay, yielding 2,004 pounds per acre; on the other 7.9 bushels of seed per acre were picked. One plot of velvet beans was cut for hay, while on the other the vines were left on the ground for fertilizer. The cowpea plants, variety Wonderful, were somewhat injured by a fungous disease of the roots; velvet beans, by reason of late date of planting and deficiency in stand, did not make an entirely satisfactory growth.

November 9 all plots were plowed, turning under either volunteer grass and rag weeds, or cowpea vines, or velvet bean vines, or cowpea stubble, or velvet bean stubble. The plowing was poorly done with a one-horse turn plow and in sowing the wheat a few days later some of the velvet bean vines were pulled up. The wheat received only mineral fertilizers, and, indeed, practically no nitrogen had been applied to these plots for three years.

The yields of wheat in 1900 were as follows:

Bushels of wheat per acre after leguminous and non-leguminous crops:

Crop in 1899.	Yield per acre.	Increase by use of legumes.	
	Bus.	*Bus.*	%
Crab grass and weeds; plowed in	3.1		
Cowpeas; stubble plowed in	11.8	8.7	280
Velvet beans; stubble plowed in........	7.8	4.7	151
Cowpeas, picked; vines plowed in	9.0	5.9	190
Velvet beans; vines plowed in........	8.5	5.4	174

Both the stubble and the vines of the legumes practically trebled the yield obtained on the plots where no legume had grown. The stubble was at least as effective as the vines, pointing to the greater economy of utilizing the vines for hay or pasturage.

June 19, 1900, all these plots were planted with Mosby corn, fertilized only with phosphate and muriate of potash. The crop was a failure on all plots, the yield of cured fodder corn ranging from 1,540 to 2,200 pounds per acre, the plots where vines had been plowed in the previous fall showing no superiority over the stubble plots, and very little increase as compared with the plot where no legume had grown. It is impossible to ascertain whether the failure with corn was due to the protracted drought during almost the whole of July or to the leaching out of the nitrogen of the legumes during the last few days in June, when 5.20 inches of rain fell within a period of four days. The latter explanation seems more probable in view of the fairly favorable rainfall after August 1, 1900, and because of similar failure of the late corn crop on the same field in 1898, when there was no long period of drought, but a brief one of even more excessive rainfall.

The history of these six plots for these four years ending with 1900 as just detailed shows very plainly that the fertilizing effects of nitrogen very quickly disappear on this light sandy sloping field, not underlaid by a clay or clayey loam subsoil; and that on such soils the stubble of cowpeas or velvet beans was as efficient as the vines, not only for the immediately succeeding crop, but for later crops as well. This narrative should add force to the recommendation we have so often given that as far as possible the stems, foliage and seed of legumes be utilized as food for animals and only what remains be employed as fertilizer.

Fertilizing Effects of Velvet Beans, and Peanuts; as Compared with Corn, Sweet Potatoes and Chufas.

On a gray sandy upland soil, free from stones and underlaid by a sandy subsoil, various crops were grown in 1899, for the double purpose of comparing them as to the amount of hog food produced and as to their effect in enriching or depleting the soil. The chufas and a part of the Spanish peanuts were consumed by shoats penned on the field. As the running variety of peanuts failed this season to make any nuts the luxuriant growth of vines was plowed under in the fall, as was also done with the vines of velvet beans and with cowpea vines after the latter had been picked. Only the ears of corn were removed from the land, and only the roots of sweet potatoes.

Rye, sown broadcast on November 13, 1899, on all plots, was employed as the crop for determining what effect the various summer crops had exerted on the fertility of the soil. The fertilizer for rye consisted of the following amounts per acre:

80 pounds of cotton seed meal.
160 pounds of ammoniated acid phosphate.
64 pounds of muriate of potash.

The effects of the legumes as fertilizers for rye would have been more striking if no cotton seed meal or ammoniated guano had been employed, but the poverty of this sandy soil made some nitrogen indispensible if absolute failure of crop was to be avoided on the plots where sweet potatoes, chufas and corn had grown.

The rye was cut April 13 and April 16, and the green forage at once weighed. No second cutting of rye was made, but the land was turned to other uses.

Yields of rye following sweet potatoes, corn, chufas, peanuts, cowpeas and velvet beans.

Preceding crop.	Yield per acre.	Increase from legumes as compared with sweet potatoes.	
	Lbs.	Lbs.	%
Rye, after sweet potatoes dug (av. 2 plots) ..	2360		
Rye, after corn, ears pulled	3440	1080	41
Rye, after chufas, eaten on the land.........	4560	2200	93
Rye, after Spanish peanuts; dug and only nuts removed	3440	1080	41
Rye, after Spanish peanuts; eaten on the land	6640	4280	181
Rye, after Whippoorwill cowpeas, drilled and picked (diseased)	4960	2600	110
Rye, after velvet beans, entire growth plowed in (av. 2 plots)	5720	3360	142
Rye, after velvet beans, nearly mature pods picked, vines plowed in	4720	2360	100
Rye, after running peanuts, entire growth plowed in (av. 2 plots)	5212	2852	121

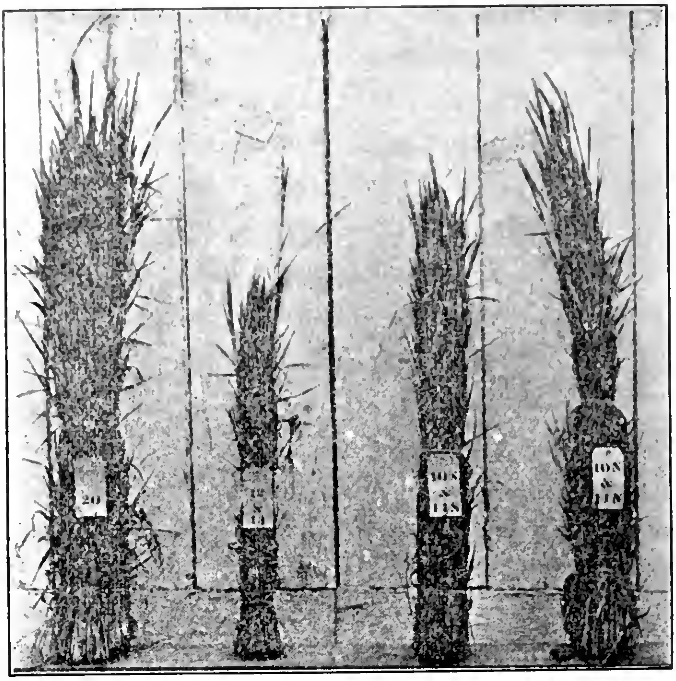

FIGURE 2. Rye from equal areas, following (20 velvet beans: and (12 & 13) sweet potatoes; (10 S & 11 S.) corn; (10 N. & 11 N.) chufas hogged

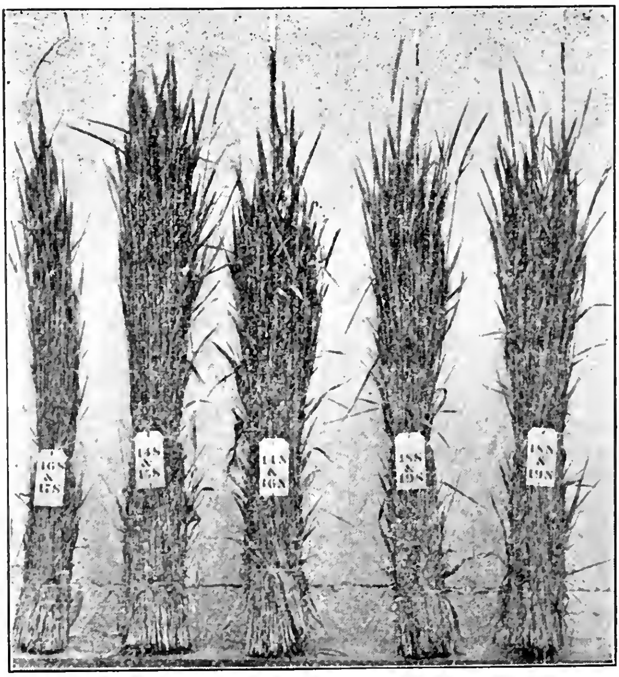

FIGURE 3. Rye from equal areas, following (16 S. & 17 S.) Spanish peanuts, dug: (18 S. & 19 S.) cowpeas; 14 N. & 15 N.) running peanuts.

The legumes increased the yield in every case as compared with sweet potatoes, the excess ranging from 41 to 181 per cent. Among the non-leguminous plants sweet potatoes was most exhausting to the soil, and chufas, when consumed on the land, the least. This agrees with common observation. In this case the exhausting effects of the sweet potatoes were not due to leaching of the disturbed soil, for all plots were plowed soon after the potatoes were dug.

Among the legumes the greatest increase, 181 per cent. was obtained on the plot where Spanish peanuts had been consumed on the land by hogs. Since the yield of peanuts here was not excessive, since the growth of tops was only moderate, and since the vines of Spanish peanuts on an adjoining plot did not greatly increase the yield, we can attribute the increase where hogs had grazed, only to an assumed quicker nutrification of the material that had passed through animals. This view finds further support in the fact that chufas consumed by hogs on the land left the soil in better condition than did either corn or sweet potatoes.

Wherever the entire growth of the several legumes was left on the land, with or without being utilized as hog food, the succeeding yield of rye was more than doubled.

Cotton was grown in 1899 on a plot adjacent to the legumes. The rye following cotton yielded 5,560 pounds per acre, but it is not fair to compare this yield with that following the legumes, because the cotton had been very heavily fertilized, and some of this fertilizer probably remained in the soil to be utilized by the rye.

Fertilizing effects of legumes on sorghum grown as the second crop.

To ascertain what differences still existed in the soil as a result of legumes grown in the summer of 1899, sorghum was sown in drills on this same field June 19, 1900, all plots being uniformly fertilized with acid phosphate. So that sorghum thus becomes the second crop after the various legumes, and is intended to reveal the residual or "left over" effects of the summer crops of 1899.

Residual fertilizing effects on sorguhm, of peanuts, cowpeas and velvet beans.

Preceding crops. Summer of 1899.	Winter, 1899, 1900.	Yield sorghum hay per acre.	Increase from legumes as compar'd with sweet potatoes.
		Lbs.	*Lbs.*
Sweet potatoes, dug	Rye	5360	
Corn, ears pulled	Rye	5760	400
Spanish peanuts, dug; nuts removed	Rye	4480	loss.
Spanish peanuts; eaten on land	Rye	4000	loss.
Cowpeas, picked	Rye	5760	400
Velvet beans, all plowed in	Rye	7110	1750
Velvet beans, pods picked	Rye	7600	2240
Running peanuts, all plowed in	Rye	6320	960
Cotton, heavily fertilized	Rye	4000	loss.
Av., potatoes, corn, cotton	Rye	5040	
Av., velvet beans, cowpeas, running peanuts	Rye	6697	1657

Evidently rye had not exhausted all the fertilizing value of the legumes. This second crop was favorably affected by all the legumes except by Spanish peanuts, the benefits of which had disappeared. The average increase on the plots where all the other legumes had grown the preceding summer was 33 per cent. as compared with the yield on the plots where corn, cotton and sweet potatoes had constituted the summer crops in 1899.

Relative Fertilizing Values of the Cowpea and Velvet Bean.

When tested on a number of crops, each grown *immediately after* the legumes, the percentage increase as compared with corresponding plots that had borne no legume was 128 per cent. from peavines, and also 128 per cent. from velvet bean vines. Additional weight is given to these figures since they represent the average of six tests with each plant. Continuing the inquiry as to their comparative value, we find that the second crop after cowpea vines showed an increase of 37 per cent. and the second crop after velvet bean vines an increase of 48 per cent. This is the average result of two comparable tests with each plant.

Comparing these two plants with reference to the fertilizing effect of the stubble on the first crop we find as the average of three tests an increase that is practically the same for the two plants.

Combining the results for the vines of each legume as shown in the first and second succeeding crops with the immediate results from the stubble of each we must conclude that at Auburn the fertilizing values of the cowpea and velvet bean are practically equal. This is true for an acre of each. In the stubble plots the average yield of velvet bean hay has been the greater, that is 4,781 pounds per acre of velvet bean hay against 3,278 pounds of cowpea hay, so that apparently pound for pound the cured tops of cowpeas have been somewhat more effective than the vines of velvet beans. This is in practical accord with the results of chemical analyses made at this station by Dr. Anderson, who analyzed peavine hay and velvet bean hay from plots where the stubble was used as fertilizer. He found 2.29 per cent. nitrogen in velvet bean vines and 2.46 per cent. of nitrogen in the cowpea vines, both samples containing 9 per cent. moisture. The nitrogen in the two stubbles was practically equal, 1 per cent.

Let us now consider the results as a whole, combining those for the two plants and assuming that the fertilizing value of cowpea vines and of velvet bean vines are equal, and that the stubble of the one plant is as effective as that of the other. In what follows the figures express the average results for cowpeas and velvet beans considered together under the name of summer legumes.

Increase in the First Crop After Plowing in the Vines of Summer Legumes.

With cotton as the first crop the increase in seed cotton per acre at Auburn was respectively 367, 546, 696, and 660 pounds of seed cotton per acre. This is an average increase of 567 pounds, worth at $2\frac{1}{2}$ cents (equal to $6\frac{3}{4}$ cents for lint, $7.50 per ton for seed) $14.17.

The yield of *seed cotton* following the vines of the summer legumes exceeded that on plots where the preceding crop had been cotton to the extent of 32, 64, 83, and 72 per cent. *The average increase in the yield of seed cotton attributable to the vines of the legumes was 63 per cent.*

With *corn* as the first crop, the increase per acre attributable to plowing in the entire growth of velvet beans was 81 per cent. or 12.3 bushels, worth, at 50 cents per bushel, $6.15.

With *oats* as the first crop, the effect of the vines of the summer legumes is seen in an increase per acre of 10.4, 20.2, and 20.4 bushels respectively. The average increase per acre was 17 bushels, worth at 40 cents per bushel, $6.80. *The increase in the first crop of oats after summer legumes was* 84, 240 and 242 per cent., *an average of 189 per cent.*

With *wheat* the increase was 5.4 and 5.9 bushels, an average of 5.65 bushels per acre, worth at 80 cents per bushel, $4.53. *The increment was* 174 and 190 per cent. respectively, an average gain of *182 per cent.*

With *sorghum* grown as the first crop after the plowing under of the vines of cowpeas and velvet beans, the increase in hay per acre was 1.6, 1.6, 2.07, and 3.11 tons, an average gain per acre of 2.1 tons of hay, worth, at $6.67 per ton, $14.02. The percentage gains were 85, 86, 57, and 86, respectively, *an average of 78 per cent.*

Increase in the First Crop After Plowing in the Stubble of Cowpeas and Velvet Beans.

With *cotton* the yield was greater after velvet bean stubble than after cotton to the extent of 18 per cent., or 208 pounds of seed cotton per acre, worth, at 2½ cents per pound, $5.20.

With *corn*, the stubble of velvet beans afforded a gain of 32 per cent. or 4.3 bushels, worth $2.15.

With *oats* grown after the plowing in of the stubble of these summer legumes the increase was 30.3 and 26 bushels, or an average of 28.1 bushels per acre, worth $11.24. This is an average gain of 334 per cent.

With *wheat* following the stubble of cowpeas and velvet beans the increase was 4.7 and 8.7, *an average of 6.7 bushels per acre, worth* $5.36. The gain amounted to 151 and 280 per cent. respectively, an average of 215 per cent.

With *sorghum* the yield of hay was increased by the stubble of the legumes to the extent of 2.01 and 2.15 tons, an average of 2.08 tons of hay per acre, valued at $13.87. *The average increase was 57 per cent.*

What Crops Were Most Favorably Affected by the Vines or Stubble of Cowpeas and Velvet Beans.

The data in the following table answer this question.

Increase in first crop attributable to vines or stubble of cowpeas and velvet beans.

Test Crop.	After Legume Vines.			After Legume Stubble.		
	No. of Tests	% Increase	Value of Increase	No. of Tests.	% Increase.	Value of Increase.
Cotton	4	63	$14.17	1	49	$11.30
Corn	1	81	6.15	1	32	2.14
Oats	3	189	6.80	2	334	11.24
Wheat	2	182	4.53	2	215	5.36
Sorghum	4	78	14.02	2	57	13.87

The percentage increase attributable to either the vines or stubble of cowpeas and velvet beans was greater with fall oats and wheat than with cotton, corn or sorghum. In other words, the *crop that was best able to utilize the nitrogen of the legumes was that one which left the land unoccupied for the shortest time between the maturing of the legume and the beginning of the new growth.* Unpublished parallel experiments with hairy vetch employed as fertilizers confirm this latter conclusion. All the facts before us indicate that after the vines or stubble of a legume are plowed under in a sandy soil the seed of the succeeding crop should be planted before the lapse of many weeks. The early occupation of the soil by roots of the young plants will serve to retain much nitrogen, which would be leached out and carried away in the drainage water if the ground should remain unoccupied for several months.

From what has just been said it should not be inferred that we are advocating the sowing of the small grains or of any small seed immediately after plowing in a large mass of vines. Instead, sufficient time should be given for the soil to become somewhat settled by the action of the rain or of harrow, drag, or roller. Small grain and still smaller seed can usually be sown after a shorter interval where the vines of the legume are utilized for hay or pasturage, leaving only the roots and stubble to be incorporated, than where the entire growth of the legume is turned under in the fall for fertilizer.

If plowing under of cowpea vines takes place after Christmas the mass of vegetable matter will have become so diminished and the stems so weak that the delay in sowing to permit of the compacting of the earth around the vegetable matter will be less necessary, or perhaps unadvisable. But this interval may be quite necessary with velvet bean vines at whatever time they are plowed under, for the mass of matter will be considerable and the material is apt to be buried in large wads.

Referring again to the last table, we see that while the small grains gave the largest percentage increase from the use of a preceding summer legume as fertilizer, the value of the increase was greatest with cotton and sorghum hay. In other words, *cotton made more profitable use of either the vines or stubble of the summer legumes on sandy land than did either corn, oats, or wheat.*

Sorghum responded freely to the abundant supply of nitrogen in the legumes, and it may be accepted as a thoroughly tested proposition that on poor or medium soil any hay plant of the grass family will return a large profit for a judicious application of nitrogen, whether this be in the form of a preceding crop of cowpeas, velvet beans, melilotus, hairy vetch, or crimson clover, or in an application of stable manure, cotton seed, cotton seed meal, or nitrate of soda.

Rotation of Crops the First Step in Soil Improvement.

The general statement may be safely made that any ordinary crop (except peanuts, cowpeas and most other legumes) can usually be produced with far greater profit when it follows some leguminous plant than when its predecessor is some non-leguminous plant, as cotton, corn, the small grains, etc. It may also be added that many, if not most, poor tracts of land can be cultivated in the usual farm crops at a profit only when a legume is occasionally grown to supply the necessary nitrogen, vegetable matter, and improvement in texture and resistance to drought.

A more general use is urged of some rotation that requires all the cultivated upland of the farm to bear cowpeas or other soil-improving plant every second, third or fourth year or oftener. The growing of legumes constitutes the cheapest means of obtaining nitrogenous fertilizers, and on farms where a large proportion of the land is devoted to legumes, the fertilizer bills can be reduced by the discontinuance of purchases of cotton seed meal and by the substitution of high grade acid phosphate for the higher priced ammoniated guanos.

A highly satisfactory rotation for cotton plantations, which has been widely tested, consists of the alternation in the order named of cotton, corn, and any one of the small grains, with cowpeas between the corn rows and also immediately following the small grains. This three-year rotation gives one-third of the land each year in cotton, the cotton immediately following cowpeas sown after small grain. One-half the total area can be devoted to cotton by a four-year rotation on this plan, as follows: Corn with cowpeas, small grain followed by cowpeas, cotton, and cotton.

The Average Immediate Fertilizing Effects of Vines as Compared with Stubble of Cowpeas and Velvet Beans.

Although in the last table a comparison of the percentage increase after vines with that after stubble is not strictly legitimate since the number of tests was unequal, yet that table throws some light on the matter.

A strictly accurate comparison of the fertilizing effects of vines and stubble as measured by the crop immediately following is shown below; in this table only those experiments are recorded where corresponding vine and stubble plots were under identical conditions of soil, date of planting, etc.

Increased percentage of vine plots over stubble plots.

	No. of tests.	%
With cotton as first crop	1	40
With corn do	4	49
With oats do	2	[31]*
With wheat do	2	[20]*
With sorghum do	2	9

*Yield after legume stubble 31 and 20 per cent. respectively greater than after vines, the latter leaving the land too loose, a condition that could probably have been avoided by better preparation.

In the crop immediately following the legumes the vines afforded the larger yield except when accidental circumstances reversed this result with wheat and oats. This excess in the first crop due to plowing under the vines was here considerable, but was it sufficient to make this method of disposing of the vines more profitable than to use them for hay?

Of the several factors on which the answer depends, we will first consider the value per acre of the increase in the first crop immediately succeeding the legume, using the values for a unit of each crop heretofore assumed (see p. . . .) and omitting results with small grains, for reasons given in the footnote.

Average superiority of vines over stubble of legumes as shown in first crop.

	No. of tests.	Increase per acre.	Value of increase	% increase
With cotton as first crop.	1	452 lbs. seed cotton	$11.30	40
With corn as first crop	4	6.6 lbs. corn.	3.30	49
With sorghum as first crop. . .	2	.5 ton hay.	3.34	9
Average in favor of vines over stubble			$5.98	

The average increase of $5.98 in the value of an acre of the first crop in favor of plowing in the vines as compared with utilizing only the stubble for fertilizer is evidently so low as to be much less than the value of the 4,030 pounds of legume hay per acre obtained from the stubble plots, which should be priced at not less than $10 per ton. As a partial offset we must bear in mind that in four of the experiments in plowing under cowpea vines the peas were first picked, the average yield in these tests being 11.1 bushels per acre. There is no such corresponding offset with velvet beans, for the seed usually do not mature in the latitude of Auburn.

If we value cowpeas at 50 cents per bushel, plus the cost of hand-picking, we have a second credit for the vines, the sum being $5.55. Adding this to $5.98, the extra value of the first crop after vines, as compared with stubble, we have a total credit for the vines when used as fertilizer of $11.53 per acre in comparison with the value of the cowpea and velvet bean hay when utilized as stock food. The average yield of cowpea hay from the stubble plots was 3,278 pounds per acre, and of velvet bean hay 4,781 pounds, or a collective average of 4,030 pounds of legume hay per acre. At $10 per ton, this would be worth $20.15 per acre. Subtracting from this, $9.50 as above, we have $8.47 as the difference in the *first year's profits* in favor of utilizing the vines as hay. However, other factors must be considered before we have satisfactorily determined whether it was most profitable to use the vines after picking the peas or to utilize the tops of both cowpeas and velvet beans for hay; chief among these factors are the relative residual fertilizing values of vines and stubble as shown by differences in the yield of the second and subsequent crops after legumes.

What is the Fertilizing Effect of Vines and Stubble of Cowpeas on the Second Crop After the Legume?

The answer is found in the following table:

	Average increase in second crop after legumes.					
	After vines.			After stubble.		
	No. of tests.	Amt. increase.	% increase.	No. of tests.	Amt. increase.	% Increase.
With corn	5	3.36 bus.	24	5	1.34 bus.	12
With oats	1	7.75 bus.	54			
With sorghum	4	2.15 tons	41			

In the second crop after the legumes there was in every case a considerable increase attributable to the use of the vines as fertilizer.

The fertilizing effect of the stubble as shown by the second crop of corn is much less than the increment due to the vines plowed under many months before.

There is a sixth test with corn not belonging in the preceding table, that gives additional data for a comparison of the second-year effects of vines with stubble. Combining the results of the six tests, we find that the corn grown as the second crop after legumes afforded a larger yield on the vine plots than on the stubble plots to the average extent of 2.1 bushels per acre, or 14 per cent.

The Duration of the Fertilizing Effects of Stubble and Vines of Cowpeas and Velvet Beans.

The stubble of these legumes repeatedly exerted so slight an effect on corn grown as the second crop, (an average of only one and one-third bushels per acre), that we may reasonably conclude that two crops mark the limit to which the benefits of legume stubble extends in cases where the soil is sandy and permeable, as at Auburn. It is quite possible that the advantages from using stubble as fertilizer might have been slightly more enduring in a stiffer soil, but in no case can such a relatively small amount of vegetable matter and nitrogen afforded by the roots and stubble influence the succeeding crops more than a few years.

It is quite a different matter when the vines, representing the entire growth of the legume (except in some cases the pods) are plowed under. We have learned from the data in previous tables that the yield where the vines were used as fertilizer was in the first crop, 63 to 189 per cent. greater than the yield of the corresponding crop immediately preceded by a non-leguminous plant; and that in the second crop the increase ranged from 24 to 54 per cent. The effect exerted by the vines of the legumes on the third succeeding crop was tested in only one field, the increase in oats as the third crop after cowpea vines being 3.2 bushels per acre, or 14 per cent. With sorghum planted in 1901 as the fourth crop immediately after the oats were cut, there was a perceptible increase on the plots where the vines of cowpeas and velvet beans grown in 1898 had been plowed under; extremely unfavorable conditions and partial failure of late sorghum detract from the reliability of the percentage figures for this, the fourth crop. For three years or four crops the large mass of vines continued to exert some influence. This experiment was conducted on a soil of the stiffest type found on the station farm, which, however, is fairly permeable to water, and which might be described as a reddish loam containing an abundance of large flint stones.

We should expect an equal mass of leguminous vegetation employed as fertilizer on clay or prairie soils to exercise a favorable influence for at least three years, or probably for as long a period as do heavy applications of coarse stable manure. Local experiments to determine the permanency of the action of the legumes are greatly needed, and correspondence is invited from parties wishing to make such tests.

It is our expectation to continue work along the lines indicated in this bulletin, and it is highly desirable that these investigations should be extended to include soils of a character different from that at Auburn, though the means of doing this in a thoroughly satisfactory manner are not now in sight.

In conclusion the writer would reaffirm his previous statement, made in Bulletin No. 107 of this station, as follows:

A Rational System of Fertilization.

Considering permanency of effect, as well as influence on the crop immediately following, the cowpea and other leguminous plants must be ranked as a cheaper source of nitrogen than is any nitrogenous material which may be bought as commercial fertilizers. The aim of the cotton farmer should be to grow such areas of legumes as will enable him to dispense with the purchase of nitrogenous fertilizers for cotton, using the funds thus saved to purchase increased amounts of phosphates or other necessary non-nitrogenous fertilizers. The money that would have been necessary to purchase one pound of nitrogen will buy about three pounds of phosphoric acid, or of potash, which larger purchases of phosphate and potash will enable the farmer to grow heavier crops of legumes. And heavier crops of legumes trap larger amounts of otherwise unavailable atmospheric nitrogen and result in further soil enrichment.

In the writer's opinion *the most promising method of increasing the yield of cotton per acre and the profits of cotton culture is by a more general use of leguminous plants as fertilizers.* These invaluable allies are by some farmers utilized and appreciated, but their use might be increased twentyfold with advantage to the current crop, to the permanent upbuilding of the soil, and to the filling of the farmer's pocket. It is putting the case very mildly to say that the average yield of cotton per acre in Alabama might be increased by at least fifty per cent. through the general use of legumes as fertilizers.

APPENDIX. Condensed statement of effects of using cowpea and velvet bean vines or stubble as fertilizers at Auburn.

Legumes.	Vines or stubble.	Test crop.			Amt. per acre, increase.		Per cent increase.		Superiority of vines over stubble		Yield of legumes per acre.		Field.
		Plant.	1st or 2nd after legumes	Year grown	From vines.	From stubble.	From vines.	From stubble.	Am't per acre.	Per cent.	Lbs. hay.	Bus. cowpeas.	
Cowpea	V. & S.	Corn	1st	'01					8 88	78	1648		D
Cowpea	V. & S.	Corn	1st	'01					.60	2	3920		M
Cowpea	V.	Cotton	1st	'99	367		32					11.8	D
Cowpea	V.	Oats	2nd	'00	5 8*		29*						D
Cowpea	V.	Oats	2nd	'00	9.7		79						D
Cowpea	V.	Sorghum	1st	'97	1.6		86						F
Velvet bean	V.	Sorghum	1st	'97	1.6		85						F
Velvet bean	V.	Corn	1st	'01	12 3		81		5.0	28			D
Velvet bean	S.	Corn	1st	'01		4.3		32			3632		D
Velvet bean	V. & S.	Corn	1st	'00					11 9	76	2800		D
Velvet bean	V. & S.	Corn	2nd	'01					3.9	33			D
Cowpea	V.	Sorghum	1st	'99	2.1		57		0.1	1		13.6	T
Cowpea	S.	Sorghum	1st	'99		2 0		55			6400		T
Velvet bean	V.	Sorghum	1st	'99	3.1		86						T
Velvet bean	S.	Sorghum	1st	'99		2.2		59			5360		T
Cowpea	V.	Corn	2nd	'00	3.6		15		2.0	8			T
Cowpea	S.	Corn	2nd	'00		1 6		6					T
Velvet bean	V.	Corn	2nd	'00	2.6		11		2 4	10			T
Velvet bean	S,	Corn	2nd	'00		.2		1					T
Velvet bean	V.	Cotton	1st	'99	546		64						T
Cowpea	V.	Cotton	1st	'99	696		83						T
Velvet bean	V.	Sorghum	2nd	'00	3.1		61						T
Cowpea	V.	Sorghum	2nd	'00	3.0		59						T
Velvet bean	V.	Oats	3rd	'01	3 2**		14						T
Cowpea	V.	Oats	3rd	'01	3 2		14						T

Velvet bean....	V.	Sorghum.	4th	'01	0.5	....	60	....	......	......	......	......	T.
Cowpeas........	V.	Sorghum.	4th	'01	0.5	....	50	....	......	......	......	......	T.
Velvet bean....	V.	Cotton...	1st	'99	660	....	72	....	......	......	......	......	T.C.
Velvet bean....	S.	Cotton...	1st	'99	....	208	....	18	452	40	......	......	T.C.
Velvet bean....	V.	Corn.....	2nd	'00	7.5	....	42	....	2.6	10	......	......	T.C.
Velvet bean....	S.	Corn.....	2nd	'00	....	2 6	....	14	......	......	......	......	T.C.
Cowpea.........	V.	Oats.....	1st	'97	10.4	....	84	....	......	......	......	......	M.
Velvet bean ..	V.	Oats.....	1st	'98	20.2	....	240	....	......	......	......	......	F.
Velvet bean....	S.	Oats......	1st	'98	....	30.3	....	360	¶7 6	¶27	3872	......	F.
Cowpea.........	V.	Oats......	1st	'98	20 4	....	242	....	......	......	......	11.	F.
Cowpea.	S.	Oats......	1st	'98	....	26.0	....	309	¶10.1	¶35	2420	......	F.
Velvet bean....	V.	Corn, late	2nd	'98	2 1	....	36	....	0 7	9	......	......	F.
Velvet bean....	S.	Corn, late	2nd	'98	....	1 9	....	33	......	......	......	......	F,
Cowpea.........	V.	Corn, late	2nd	'98	0 9	....	16	....	......	......	......	......	F.
Cowpea.........	V.	Corn, late	2nd	'98	....	0.4	....	7	¶1.0	¶6	......	......	F.
Velvet bean....	V.	Wheat....	1st	'00	5.1	....	174	....	......	......	......	......	F.
Velvet bean....	S.	Wheat....	1st	'00	....	4.7	....	151	......		......	......	F.
Cowpea.........	S.	Wheat....	1st	'98	5.9	....	190	....	......	......	......	7 9	F.
Cowpea.........	V.	Wheat....	1st	'00	....	8.7	....	280	¶2 8	¶31	2004	......	F.
Sp. Peanuts	††	Rye......	1st	'00	4280	....	181	....	......	......	......	......	F.
do. nuts remv'd	....	Rye......	1st	'00	1080	....	41	....	......	......	......	......	F.
Run'g Peanuts..	All.	Rye......	1st	'00	2852	....	121	....	......	......	......	......	F.
Cowpea.........	V.	Rye......	1st	'00	2600	....	110	....	......	......	......	......	F.
Velvet bean....	V.	Rye.....	1st	'00	2360	....	100	....	......	......	......	......	F.
Velvet bean....	All.	Rye......	1st	'00	3360	....	142	....	......	......	......	......	F.
Sp. Peanuts....	V.	Sorghum.	2nd	'01	Loss.	....	Loss.	....	......	......	......	......	F.
Run'g Peanuts.	All.	Sorghum.	2nd	'01	960	....	16	....	......	......	......	......	F.
Cowpeas........	V.	Sorghum.	2nd	'01	400	....	7	....	......	......	......	......	F.
Vel. beans (av.)	V.	Sorghum.	2nd	'01	1995	....	37	....	......	......	......	......	F.

* Nitrate of soda used both on non-legume and legume plot.

** Reducing the increase to that on corresponding cowpea plot.

¶ Stubble afforded the larger yield.

†† Peanuts eaten by hogs on land where grown.