BULLETIN NO. 22, NEW SERIES.

AGRICULTURAL EXPERIMENT STATION,

OF THE

Agricultural and Mechanical College,

AUBURN, ALA., - - JANUARY, 1891.

EXPERIMENTS WITH COTTON.

REPORT OF ALABAMA WEATHER SERVICE.

☞The Bulletins of this Station will be sent Free to any citizen of the State, on application to the Director.

Smith, Allred & Co., State Printers and Binders, 24 Commerce St., Montgomery, Ala.

BOARD OF VISITORS.

COMMITTEE OF TRUSTEES ON EXPERIMENT STATION :

HON. J. G. GILCHRIST, HON. R. F. LIGON, HON. J. B. MITCHELL.

BOARD OF DIRECTION.

W. L. BROUN.....President.
J. S. NEWMAN.....Director and Agriculturist.
N. T. LUPTON.....Vice-Director and Chemist.
P. H. MELL.....Botanist and Meteorologist.
G. F. ATKINSON.....Biologist.

ASSISTANTS:

ISAAC ROSS.. First Assistant Agriculturist, charge Live Stock and Dairy.
JAS. CLAYTON,.....Second Assistant Agriculturist.
J. T. ANDERSON, PH. D.....First Assistant Chemist.
L. W. WILKINSON, M. SC.....Second Assistant Chemist.
J. F. WILKINSON, B. SC.....Third Assistant Chemist.
A. M. LLOYD, B. SC.....Assistant Botanist.
W. B. FRAZER.....Clerk and Accountant,

EXPERIMENTS WITH COTTON—1890.

J. S. NEWMAN—JAS. CLAYTON.

Comparison of Varieties.

Seven varieties of cotton were planted April 28th, 1890, for the purpose of comparing their productiveness, yield of lint from seed cotton and quality of lint. The Cook and King varieties were received from the Secretary of Agriculture at Washington, Storm Proof was planted from seed presented by W. J. Smilie, Baileyville, Texas, who originated it; Southern Hope and Peterkin were from seed grown on the station in 1889, Peerless and Truitt were presented by Mr. James Clayton from his farm near Opelika, Ala.

The soil upon which the first five varieties were grown was a uniform piece of sandy creek bottom which has been gradually brought up to an excellent state of productiveness during the last seven years.

The comparison is perfectly accurate and reliable in every respect. The following tabulated statement shows the comparative yield per acre in seed cotton and lint, and the per cent. of lint.

The King and Cook varieties were on a somewhat different soil from the others and upon smaller areas, and hence, are not comparable with them as to yield per acre, but are compared with each other.

As the seed cotton was picked, each variety was securely stored in a bin to itself and at the time of ginning all were weighed under like conditions and ginned separately. A sample of the lint of each was taken, numbered and sent by

express to Mr. H. C. Parker, an expert at Montgomery, for classification and valuation. His report contains matter of much interest to producers of cotton. Mr. Parker, as is shown in his report, knew the samples by number only, but he seems to have had no difficulty in separating the longer stapled varieties from the short in grading them. The season for gathering cotton was not favorable for good samples.

RESULTS.

Plot	Name of Varieties.	Yield in lbs. Seed Cotton per acre.	Yield in lbs. Lint per Acre.	Per cent of Lint.	Value per Acre.	Priced by Mr. Parker.
1	Peerless.....	2650	876	33 1-17	$76 65	8¾
2	Peterkin.....	2212	786	35½	72 70	9¼
3	Southern Hope...	2239	638	28½	70 18	11
4	Storm Proof.....	2170	717	33 1-24	60 94	8½
5	Truitt.....	2400	783	32⅝	67 53	8⅝
* 6	W. A. Cook.....	1405	385	27⅓	53 90	14
* 7	T. J. King.....	1745	580	33 1-5	49 30	8½

*These were on poorer soil than 1 to 5 and compare only with each other except in price.

REPORT OF MR. HENRY C. PARKER, CLASSIFYER OF COTTON FOR LEHMAN, DURR & CO., MONTGOMERY, ALA.

No.	Classification.	Length in Inches.	Price.	REMARKS.
1	Shy Midling.....	7/8	8 3/4	These have nothing specially to recommend them. The price is mainly a question of handling.
4	Strict Low Midling..	7/8	8 1/2	
5	Fully Str't Low M'd'g	7/8	8 5/8	
7	Strict Low Midling..	7/8	8 1/2	
2	Midling	1 1/8	9 1/4	1/2c for length, stronger and longer.
3	Midling	1 3/8	11	Like Allen variety.
6	Strict Low Midling..	1 1/2	14	Touch of Sea Island.....

"These last require particular attention as to their prolificness and yield of lint. The light lands are hardly adapted to them without continual renewal of seed as they lose in strength and length. Fertilizers aid considerably in keeping them up." The numbers of samples above correspond to plot numbers in table of results.

These varieties of cotton were all planted in checks four feet each way. The plants were thinned by hand and plowed both ways, thus entirely dispensing with hoeing.

This was too thick for the long limb varieties which so completely shaded the early fruit as to cause rotting of the bolls. The stalks of the Peerless variety fell over with their weight of fruit and suffered from rotting where the bolls rested upon the ground. It was not practicable to ascertain the comparative loss by the different varieties from this cause. The season was very favorable for production but very unfavorable for picking. The following statement of rainfall from April to October, inclusive for 1890, kindly furnished by Mr. J. M. Quarles, assistant in meteorology, compared with the average precipitation for twelve years as given in Bulletin No. 18, *Climatology of Alabama*, shows an

abnormal precipitation in May, August, September and October. Since the cotton boll is opened by the drying and consequent contraction of the exterior of each lobe of the bur, long continued wet weather during September and October is disastrous, not only to the quantity, but the quality of the product.

PRECIPITATION FROM APRIL TO OCTOBER, 1890, AND AVERAGE.

	1890	AVERAGE 12 Y'RS. 1855—1889.
	INCHES	INCHES.
April	1.52	3.82
May	6.18	3.17
June	3.82	5.28
July	4.80	4.37
August	5.75	4.20
September	5.53	3.29
October	7.24	2.48

It will be observed that there were 12.74 inches of rain during September and October of last year against 5.77 inches as the average of twelve years, or more than twice the normal quantity.

EXPERIMENT WITH PHOSPHATE.

Question:—Will the vegetable matter in freshly cleared land supply all the nitrogen needed by the cotton plant?

This experiment was conducted upon land from which the large timber, principally longleaf pine, had been removed many years before, but was cleared for the plow during the winter of 1889-90. It was very thoroughly broken for "new ground," was very uniform in character and, as shown by the yield where no manure was used, was naturally very poor. As shown by the results of the "soil test of fertil-

izers" conducted on an adjacent acre, the soil is decidedly deficient in phosphoric acid. In addition to the above question, an inquiry as to the quantity of phosphate that can be profitably applied upon such land is made. The results show that the plant was not commensurately profited by the additional 500 lbs. and that the decomposition of the vegetable matter did not furnish all of the nitrogen needed by the cotton plant.

PHOSPHATE ALONE, AND PHOSPHATE AND NITROGEN ON NEW GROUND.

Plot No.	Names of Fertilizers.	Pounds used per acre.	Yield in pounds Seed Cotton per acre.						Cost of Fertilizers per acre.	Profit from use of Fertilizers	% profit from use of Fertilizers.
			1st picking Sept. 1st.	2d picking Sept. 18.	3d picking Oct. 15.	4th picking Nov. 10.	5th picking Nov. 25.	Total.			
1	Acid Phos.	500	212	382	168	25	32	819	$ 4 12½	$ 6 67	48½
	C. S. Meal.	500	.....	.....	.....	.....	.....	.....	.....	.....	.....
2	Acid Phos.	500	310	453	152	47	55	1017	9 55	7 19	52 1-5
3	Acid Phos.	1000	270	400	150	29	34	883	8 25	4 47	32½
4	No man're	.....	9	60	147	169	74	459	.....	.....	.....
	C. S. Meal	1000	.....	.....	.....	.....	.....	.....	.....	.....	.....
5	Acid Phos.	1000	226	406	349	119	113	1213	19 10	3 52	25½

Floats vs. Acid Phosphate.

In several experiments, previously conducted to ascertain the comparative agricultural value of the phosphate rock, ground to impalpable powder, known as floats, with that of acidulated phosphate, the results have indicated, that used in conjunction with cotton seed meal, floats were more prfitable than the acid phosphate, taking into consideration the fact that floats contain nearly twice the percentage of phosphoric acid.

Thc soil used in this experiment was sandy drift that had been lying out many years. No commercial fertilizer had been previously applied to it. It had been closely depastured for seven years.

The floats were at some disadvantage in comparison of costs, since they were purchased at ton rates, while the acid phosphate was bought at car load rates. The results are so plainly set forth in the table that comments are unnecessary.

ACID PHOSPHATE AND FLOATS COMPARED.

RESULTS.

Plot.	Fertilizers used per Acre.		Seed Cotton gathered per Acre.					Total Yield per Acre.	Cost of fertilizer per Acre.	Profit from Fertilizers.	Per ct. profit from Fertilizers.
	Pounds.	Names.	1st Picking Sept. 1.	2d Picking Sept. 17.	3d Picking Oct. 15.	4th Picking Nov. 1.	5th Picking Nov. 25.				
No. 1.	400	Floats.	40.0	167.2	218.4	73.6	42.4	541	$3.14	$2.77	26¾
No. 2.	800	Floats.	72.0	220.0	319.2	76.8	43.2	731	6.28	5.33	51½
No. 3.	.....	No manure	.....	.....	.....	.....	.....	344	.....	.....	.....
No. 4.	800	400 Floats, 400 C. S. Meal.	208.0	389.6	172.8	38.4	24.8	833	7.48	7.19	69 3–5
No. 5.	800	400 C. S. Meal, 400 Acid Phos.	344.0	341.6	83.2	24.0	21.6	814	7.64	6.46	62.3–5

Cotton at Different Distances in Row and Drill,
With same quantity of manure per acre and same distance, with different quantities of manure.

This experiment was conducted upon land, of almost exactly uniform quality, which had been somewhat improved by rotation of crops and fertilizing during six years. It produced without manure, in 1884, 3½ bushels of corn per acre, under the influence of a favorable season. After thoroughly preparing and bedding the land, a Thomas harrow was drawn across the beds to reduce their height and leave them in good condition for the planter.

Owing to the difficulty previously experienced in securing and maintaining a stand when planted in hills, the seed were sown in the usual way along the row with the planter. In order to secure perfect accuracy and insure a stand, lines were stretched across the rows at the desired distances apart, and the cotton chopped between them, leaving two stalks to the hill, under or as near as practicable to the lines.

By this means a perfect stand was secured. After danger of attack from cut worms was past, the stand was reduced to one stalk to the hill. Besides the comparison of the effects of giving different areas to the plants, the effects of doubling the quantity of manure per acre is tested in plats 1 and 5 and 2 and 6, which are adjacent, and have the plants at the same distance each way, 1 and 5 being planted 4 ft. by 5 ft., and 2 and 6, 4 by 4 ft.

To half of plat 8, 200 lbs. of kainit were applied,* August 13th, and to the other half, 200 lbs. of cotton seed meal. The object of these applications was to prolong and thereby increase the fruitfulness of the plants. Each of these is compared with plot 4, which had the same quantity of manure, applied before planting, that plot 8 had, and received no additional application. The labor of applying them, as well as the additional manures, seems to have been wasted.

* Owing to the continued rains this application was made later than intended.

It will be observed that crowding the plants as in plots 7, 10 and 11, hastened maturity, as is shown by the yield at the first picking. Half the crop on these plots was gathered September 7th. As appeared in similar experiments in 1889, 4 by 2 seems to be the best distance for *such land* as was used for this experiment. Doubling the fertilizer was not profitable.

COTTON AT DIFFERENT DISTANCES AND WITH DIFFERENT QUANTITIES OF MANURE.

Plot No.	Distance Planted.	Fertilizers Used per Acre.		Yield in lbs. Seed Cotton per Acre				Total.
		Pounds.	Names.	1st Picking Sept 7.	2nd Picking Sept. 19.	3rd Picking Oct. 20.	4th Picking Nov. 10	
1	4 x 5 ft.	1000	500 lbs. Cotton Seed Meal, 500 lbs. Acid Phos	198 4	574.0	297.6	62 0	1132
2	4 x 4 ft.	1000	" " " "	273.2	580.0	219.6	28 0	1101
3	4 x 3 ft.	500	250 lbs. Cotton Seed Meal, 250 lbs. Acid Phos	290.8	509 2	198 0	16 0	1014
4	4 x 2 ft.	500	" " " "	372.8	557.6	176.0	24.8	1131
5	4 x 5 ft.	500	" " " "	130.4	460 8	382 0	65.6	1039
6	4 x 4 ft.	500	" " " "	192 0	472 8	166 4	20.0	851
7	4 x 1 ft.	500	" " " "	430 4	374 8	64.4	8.4	878
8	4 x 2 ft.	700	250 lbs. Cotton Seed Meal, 250 lbs. Acid Phos., and 200 lbs. Cotton Seed Meal, extra, August 13th.....	284.8	487.2	231 2	30 4	1034
8½	4 x 2 ft.	700	250 lbs. Cotton Seed Meal, 250 lbs. Acid Phos., and 200 lbs. Kainit, extra, August 13th	321.6	465 6	140.0	23 2	950
9	3 x 3 ft.	500	250 lbs. Cotton Seed Meal, 250 lbs. Acid Phosphate	407.2	398 8	198.8	24.8	1030
10	3 x 2 ft.	500	" " " "	410.8	293.2	111.2	8 4	824
11	3 x 1 ft.	500	" " " "	404.8	268 0	115.2	15.2	803
*12	4 x 5 ft.	500	" " " "	142 8	260.4	270 0	13 2	686.4

*This compared with plot 5.

DIAGRAM OF PLOTS.

PLOT 9. 3 x 3 feet. 250 lbs. C. S. Meal. 250 " Acid Phosphate per acre.	PLOT 5. 4 x 5 feet. 250 lbs. C. S. Meal. 250 " Acid Phosphate per acre.		PLOT 1. 4 x 5 feet. 500 lbs. C. S. Meal. 500 " Acid Phosphate per acre.
PLOT 10. 3 x 2 feet. 250 lbs. C. S. Meal. 250 " Acid Phosphate per acre.	PLOT 6. 4 x 5 feet. 250 lbs. C. S. Meal. 250 " Acid Phosphate per acre.		PLOT 2. 4 x 4 feet. 500 lbs. C. S. Meal. 500 " Acid Phosphate per acre.
PLOT 11. 3 x 1 feet. 250 lbs. Acid Phosphate. 250 " C. S. Meal. 250 " Acid Phosphate per acre.	PLOT 7. 4 x 1 feet. 250 lbs. C. S. Meal. 250 " Acid Phosphate per acre.		PLOT 3. 4 x 3 feet. 250 lbs. C. S. Meal. 250 " Acid Phosphate per acre.
PLOTS ¼ acre each except 8 and 8½, which are ⅛ acre each.	PLOT 8. 4 x 2 feet. 250 lbs. C. S. Meal. 250 lbs. acid phosphate per acre. 200 lbs. of kainit added 13th August.	PLOT 8½. 4 x 2 ft. 250 lbs. C. S. Meal. 250 lbs. acid phosphate per acre. 200 lbs. C. S. Meal added 13th Aug.	PLOT 4. 4 x 2 feet. 250 lbs. C. S. Meal. 250 " Acid Phosphate per acre.

Plot 12 extends along the side of plot 5, and partly by 1 and 9, and is compared with plot 5, the object being to test the effect of so-called rest while closely pastured.

During 1883 the land occupied by both 5 and 12 was cultivated in cotton by a negro tenant without fertilizer. During the winter of 1883–'4, that occupied by 12, was turned out into a standing pasture, and has been since very closely pastured. Plot 5 has been in cultivation continuously. The question, therefore, is, does such rest improve land? Plot 12 had the same treatment in every respect as plot 5 in 1890.

Plot 5 has produced profitable crops each season since 1883, plot 12 has produced no crop since that year.

Plot 5 produced 1,039 lbs. seed cotton and 12 produced 686 lbs., a difference of 353 lbs. per acre in favor of the land continuously cultivated over that supposed to have *rested* seven years. The value of the difference in production is more than the market value of the land.

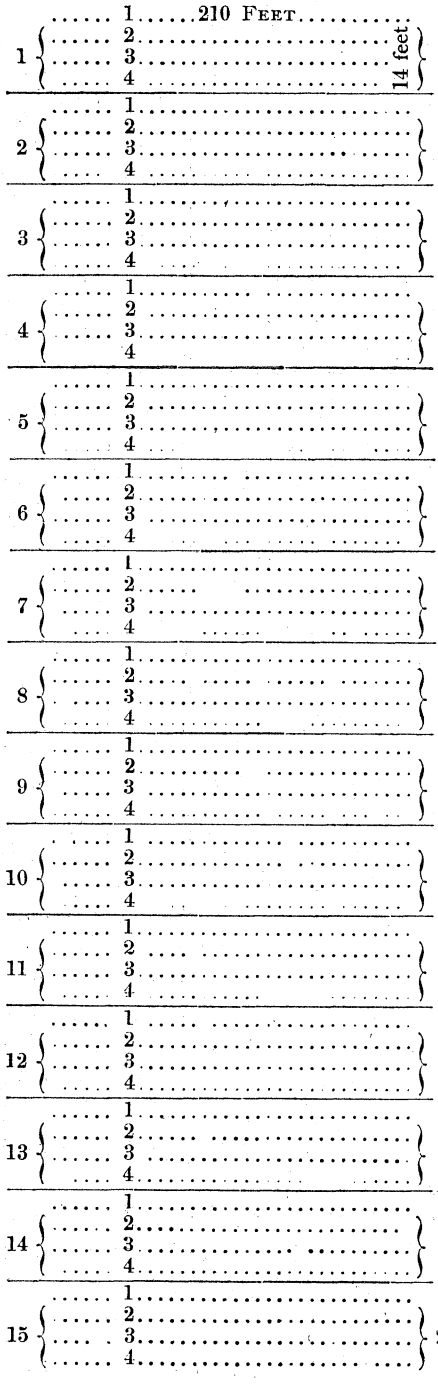
Soil Test of Fertilizers With Cotton.

For the purpose of learning the *chemical needs* of the various soils of the State, chemicals already prepared and weighed, ready for application, were furnished thirty *volunteer experimenters* cultivating typical soils of as many sections of the State, with the request that they be applied, as far as practicable, to soil upon which no commercial or other fertilizer had ever been used.

In order to compare the soil of this section with those in the different parts of the State, the same chemicals in character and quantity were applied upon an old field which had been lying out for many years, and for the last seven closely pastured. No commercial fertilizers was ever applied to this soil previous to 1890. It had been cleared so long that even the long-leaf pine stumps had disappeared.

The following diagram of the plots will convey a clear idea of the arrangement for securing accuracy of results. The two centre rows of each plot were used since the outside rows are influenced by the manure in the adjacent plots:

DIAGRAM OF EXPERIMENT PLOTS.



The manures were applied with the utmost care, and almost a perfect stand secured. The cultivation throughout was perfectly satisfactory. When the cotton was large enough to be exempt from attack by the cut worm, the stalks in the two last rows in each plot were counted and reduced to the same number in each by pulling out from those having the largest number, down to the last number found in any plot. This is the only practicable plan by which an absolutely uniform stand can be secured.

Observations were made, as shown in the table, upon the height, condition and appearance of the plants on the different plots, June 14th, July 8th, August 11th, and September 11th. The quantity gathered at the different pickings was recorded and is printed to show the effects of different manures in hastening the growth and maturity of the crop. It will be observed, that while from some plots more than *ninety* per cent. of the crop was gathered by the 15th of October, from others less than *sixty* per cent. was gathered. This is often a very important effect of manures, since the price is usually better during September and October than later, and a laborer can gather fully one-third more per day in September than in November or December. Besides, by reference to the table giving the average rainfall it will be observed that September and October are generally comparatively dry months, and hence favorable for maturing and gathering cotton. In order to have a check upon the accuracy of the field weights, the seed cotton from each plot was kept separate, tied up in sacks and suspended from the joist of the gin house, where it was exempt from liability to be disturbed by either men or mice. At the time of ginning, the cotton was re-weighed under like conditions. The columns in the table headed "field weights" and "gin house weights" show the loss of each plot up to December 17th, when it was ginned. The results indicate that the soil upon which the experiment was conducted was especially

deficient in phosphoric acid, since a marked increase in production results from its application in every instance, whether used alone or in combination with potash or nitrogen. The results from kainit and sulphate of ammonia used either singly or together, indicate that the plant was unable to utilize these without phosphoric acid. That the soil needed both potash and nitrogen is shown by the increased yield where these are combined with phosphoric acid.

That these, potash and nitrogen, were to some extent available in the soil is shown by the fact that phosphoric acid alone gave good results. The *indications* from the results of this experiment are therefore, that the soil needs all three of the principal ingredients, nitrogen, potash and phosphoric acid but is most deficient in the latter.

Attention is invited to the *per centages* of increase from the use of the different manures, as shown in the table.

It is interesting also to note the cost of fertilizers applied per acre, the actual profit and the per cent. of profit. As the profit and per cent. are calculated upon and due to the increase resulting from the fertilizers and as all other expenses are the same on the unfertilized land as upon the fertilized the effects of the fertilizers alone are considered.

While the stable manure produced the largest increase and the largest profit per acre, attention is called to the fact that it was applied at the rate of nearly *two tons* per acre or half a ton more than the amount annually saved from each mule kept. There is no question about the efficacy of good stable manure properly used but the available supply is too small.

The late fall was favorable to the plots which produced little since a larger per cent. of the fruit on these was produced late in the season than upon the plots upon which the plants grew off more promptly in early summer.

Attention is invited to the effect of kainit in retarding the appearance of blight as well as to the fact that early growth and heavy fruitage was favorable to its attack—see and compare plots 2, 3, 5, 7 and 9.

SOIL TEST OF

Plot No.	Fertilizers used per Acre. Pounds.	Names.	June 14th. Condition of Plant.	Height in inches	July 8th. Condition of Plant.	Height in inches	August 11th. Condition of Plant.	Height in inches	Leaf Blight.
1	90	Sulphate Ammonia,	Yellow,	2 to 5	Yellow, not vig.	4 to 11½	Green, vig. and fruit'g rapidly	7 to 16	Free.
2	195	Dissolved Bone Black,	D'k green & vig'us	5 to 10	Color good & vig	11 to 24	Gr'n and fruiting ended.	15 to 30	Badly.
3	150	Kainit,	Green,	2 to 6	" "	6½ to 14	Gr'n, vig. and mak'g rapidly	10 to 18	Free.
4		No manure,	Yellow,	2 to 5	Yellow, not vig.	4½ to 9	"	7 to 13	"
5	240	150 Kainit, 90 Sul. Am.	"	2 to 5	Col. g'd and vig.	4½ to 9	"	9 to 20	"
6	285	195 Dis. Bone Black 90 Sul. Ammonia,	D'k green & vig'us	4 to 8	" "	7 to 22	Vigorous and fruitg slightly	11 to 30	Slight.
7	345	195 Dis. Bone Black, 150 Kainit,	" "	5 to 10	Vig., col. little off	8 to 24	"	11 to 30	Free.
8		No Manure,	Yellow,	2 to 5	Yel. and not vig	4½ to 9	Vig and making rapidly.	6 to 13	"
9	435	195 Dis. bone blk, 90 sul. am., 150 kainit,	Green,	4 to 8	Col. g'd and vig.	10 to 22	Vig. and fruiting slightly.	14 to 30	Slight.
10	300	Floats,	Light Green,	2 to 6	" "	7 to 12	Vig. and making rapidly.	11 to 24	"
11	390	300 Floats, 90 sul. am.	" "	2 to 6	" "	8 to 15	Vig. and making moderatly	12 to 26	"
12		No manure,	Yellow,	2 to 5	Yellow not vig.	4½ to 9	Vig. and making rapidly.	7 to 13	Free.
13	795	Green cotton seed,	Yellow,	2 to 5	Very yellow.	9 to 15	"	12 to 28	Slight.
14	1095	795 Green cot'n seed 300 Floats.	Light Green,	2 to 6	Col. g'd and vig	9 to 20	"	11 to 30	"
15	3975	Stable manure,	Very vigorous and dark green,	5 to 10	Col. little off and vigorous,	12 to 26	Fruiting ended.	18 to 30	very sl't

FERTILIZERS, 1890.

Plot.	September 11th. Condition of Plant.	Leaf Blight.	Yield in Pound Seed Cotton per Acre. Field Weight. 1st Picking Sept. 1.	2nd Picking Sept. 17	3rd Picking Oct. 15.	4th Picking Nov. 8.	5th Picking Nov. 25.	Field Weights Total.	Ginhouse weights. Total.	Per ct. of increase over no manure.	Cost of Fertilizers per acre.	Profit per acre.	Per cent of profit.	Loss.	Per cent of loss.	Per cent gathered to Oct. 15th.
1	Mak'g sm'll and vig	V'y slight	9	33	108	75	39	264	255		$3 30			5 70	1 23	57
2	Matured,	V'y badly	183	270	141	36	18	648	624	88.4	2 53	6 59	64			92
3	Vigorous and mak'g	Free,	6	27	174	135	72	414	390	20.3	1 37	73	7			50
4	Vig'us and mak'g,	Slight,	9	45	138	108	51	351	330							55
5	Vig'us and mak'g,	Free,	6	30	123	144	75	378	369	9.9	4 67			3 65	55	42
6	Matured,	Badly,	180	345	186	66	36	813	765	136.3	5 83	8 24	80			88
7	"	Slight,	198	411	222	69	39	939	900	173.0	3 90	13 95	135			88
8	Small, vig.and m'kg	V'y slight	12	42	129	105	36	324	309							55
9	Matured,	Badly,	198	450	303	63	33	1047	963	204.4	7 20	13 86	134			91
10	Matured and small,	Badly,	81	225	162	45	24	537	510	56.1	2 36	3 43	33			87
11	Matured,	Badly,	105	255	258	105	36	759	732	120.6	5 66	6 79	66			81
12	Making,	Slight,	9	66	159	93	30	357	342							66
13	Matured,	Badly,	48	228	222	69	21	588	570	71.0	3 57	3 75	36			85
14	Matured,	Badly,	156	420	249	63	30	918	882	167.2	5 93	11 29	109			90
15	Matured,	Badly,	345	585	162	33	21	1146	1119	233.1	3 97	20 09	194			95

INTERCULTURAL FERTILIZATION.

In order to test the efficacy of the application of additional fertilizer during the growth of the plant in prolonging its fruiting period and increasing the yield, two hundred pounds of cotton seed meal per acre were applied at the 2nd plowing of the cotton June 18th, and covered lightly with scrape.

Two hundred more were applied in the same way at the last plowing, July 30th. These were applied to two plots to which two hundred lbs. of cotton seed meal and acid phosphate, mixed in equal parts of each, were applied in the drill before planting, and were compared with a third plot to which the same quantity of cotton seed meal and acid phosphate were used before planting but to which no subsequent applications were made.

The results presented in the accompanying tabulated statement show that the average increase caused by the additional applications was 339 lbs of seed cotton.

The intercultural applications had the effect of continuing the growth and fruitfulness of the cotton after that on plot 3 had ceased to grow.

The results are plainly set forth in the tabulated statement.

INTERCULTURAL FERTILIZATION.

Plot No.	Fertilizers per Acre.		How and When Applied.	1st Picking Sept. 1st	2nd Picking Sept. 17.	3rd Picking Oct. 15.	4th Picking Nov. 8.	5th Picking Nov. 25.	Total yield seed cotton per acre.
	Pounds.	Names.							
1	600	Cot'n Seed Meal and Acid Phos.	200 lbs. C. S. Meal and Acid Phosphate in equal parts before planting. 200 lbs. C. S. Meal at second plowing. 200 lbs. C. S. Meal at last plowing.	222.3	288.6	195 0	97.5	62.4	865.8
2	600	Cot'n Seed Meal and Acid Phos.	200 lbs. C. S. Meal and Acid Phosphate in equal parts before planting. 200 lbs. C. S. Meal at second plowing. 200 lbs. C. S. Meal at last plowing.	206.7	265 2	195.0	81.9	54.6	803.4
3	200	{C. S. Meal and Acid Phos. in equal parts.....}	100 lbs. C. S. Meal. 100 lbs. Acid Phosphate mixed and applied before planting.	202.8	175.5	78.0	23.4	15.6	495.3
4		Without manure.....		9	45	138	108	51	351

Recapitulation.

1. The high price commanded by the long staple varieties will justify the most careful effort through selection and breeding to increase their productiveness.

2. While the decomposition of the vegetable matter in the "new ground" did not furnish all of the nitrogen needed by the cotton, the increase from phosphate alone is satisfac-factory, and the increase caused by the addition of nitrogen did not justify its use.

3. A part of the phosphoric acid in floats plainly becomes available to plants the first season. This is facilitated by combining them with cotton seed meal.

Floats and cotton seed meal have uniformly equaled acid phosphate and cotton seed in producing power.

4. Of the different distances experimented with, 4 ft. by 2 ft. gave best results in 1889 and 1890. Thick planting hastens maturity. 1,000 lbs. fertilizer per acre was not as profitable as 500 lbs. The addition of cotton seed meal as late as August 13th was not profitable.

5 This experiment indicates that land improves more under continuous, judicious cultivation than uncultivated, in closely grazed pasture.

6. The unfertilized soil of this station needs nitrogen, potash and phosphoric acid. It is especially deficient in the latter. Kainit causes the cotton plant to retain its leaves after they have blighted where none is used.

Needed fertilizers hasten the maturity of the cotton plant. The *per cent* of *profit* from a *judicious use of fertilizers*, followed by intelligent cultivation, is most satisfactory.

7. Cotton seed meal, applied interculturally, in June and July, increased the crop more than cotton seed meal and acid phosphate, applied before planting.

REPORT

OF THE

ALABAMA WEATHER SERVICE.

Co-operating with the U. S. Signal Service.

December, 1890.

STATE POLYTECHNIC INSTITUTE,
Auburn, Ala., January 15th, 1891.

The month began with clear and cool weather, but the temperature gradually rose, and the average for December was 3.°2 above the normal. The weather was generally mild and pleasant, but never too warm to prevent the saving of meat. The middle of the period was dry and dusty, almost as much so as mid-summer. Flowers were in bloom during most of the month. The lowest recorded temperature was 20° at a few stations, and this low range occurred only on three days, during the first and last weeks of December.

The amount of rain that fell during the month was small, the average being 2.19 inches below the normal.

A low pressure passed over the State on the 3d that was followed by rain in all sections, with an immediate depression in temperature. Another low pressure occurred on the 24th and 25th that produced a similar result; the rain fall at Auburn being as high as 1.50 inches in less than twelve hours. The temperature fell to 31° at the Central Station on the 27th, while in North Alabama the reading of the thermometer was as low as 20°.

The season was excellent for sowing small grain, and the reports from the observers indicate that the farmers have availed themselves of these fine conditions.

P. H. MELL,
Director.

J. M. QUARLES,
Assistant.

MONTHLY SUMMARY.

Atmospheric pressure (in inches.) — Monthly mean, 30.227; maximum observed, 30.632, at Auburn on 28th; minimum observed, 29.780, at Uniontown on 3d; range for State, .852

Temperature (degrees F.) — Monthly mean, 49.8; highest monthly mean, 58 2, at Brewton; lowest monthly mean, 42.4, at Valley Head; maximum, 91, at Brewton, on 5th; minimum, 20, at Valley Head, 4th, 28th and 29th, and at Citronelle on 9th; range for the State, 71; greatest local monthly range, 68, at Brewton; least local monthly range, 39, at Chattanooga.

Precipitation, including melting snow, (in inches).—Average for the State, 2.30; greatest, 3.97, at Double Springs; least, 1.35, at Bermuda.

Mean relative humidity, 68, at Auburn; 66 at Uniontown; 86 at Valley Head.

Wind — Prevailing direction, N. W. Miles traveled, 5,515, at Chattanooga; 6,332, at Mobile; 4,030, at Montgomery; 3,236, at Auburn.

ANNUAL SUMMARY.

Maximum barometer, 30.632, at Auburn, 28th of December. Mean barometer for year, 30.110 inches. Minimum barometer, 29.615, at Chattanooga, Tenn., on 29th of October; range, 1.017.

Mean relative humidity, 74.6; average temperature, 65.6; maximum temperature, 105, at Opelika, 1st and 3d of July; minimum, 10, at Valley Head, 2d March; range, 95. Clear days, 132; fair days, 117; cloudy days, 116; days of rain, 91; annual rain fall, 50.69 inches, is 1.2 below the normal; monthly rain fall, 4.22; highest rain fall for any month, 12.10, at Fayette Court House, during February; lowest, 0.00, at Bermuda and Columbiana, during November.

NOTES FROM OBSERVERS.

Livingston, (J. W. A. Wright).—The average temperature for this month was 47°, which is 1° warmer than the normal for December. The coldest day was 24° on 19th, which is 4° higher than the coldest for the past three winters. The entire rainfall for the month 1.59 inches, the smallest amount for December in 20 years with one exception, when in 1873, we had only 1.25 inches. Our average or normal for December in past 20 years is 5.09 inches. Our rainfall by month, for 1890, has been as follows: January, 1.67; February 6.72; March, 4.73; April, 3.06; May, 4.15; June, 4.50; July 4.80; August, 5.75; September, 5.93; October, 2.60; November, 0.67; December 1.59, making a total of 46.17 inches. Total rainfall in 1889, 39.38; 1888, 57.21; 1887, 44.90 inches.

Greensboro, (M. H. Yerby).—It has been unusually dry and mild for December. Some days it was as dusty as mid-summer; the street sprinklers were in constant use throughout the entire month. There are a few tender plants still blooming in open air. I have in my garden a young peach tree now in full bloom. There has been a considerable quantity of pork slaughtered in this vicinity.

TABLE OF SOIL TEMPERATURES—December, 1890.

(The observations for this table were taken at Auburn, Ala.)

A. M. LLOYD, Observer.

NOTE—There are three sets of thermometers—Nos. 1 and 2 are situated on a hill in sandy soil, and No. 3 is placed near a small stream in bottom land. The depth of instruments range from 1 inch to 96 inches below the surface, and the observations are made three times each day—morning, noon, and evening.

Depth in Inches.	Set No. 1, on Hill.	Set No. 2, on Hill.	Set No. 3, in Bottom.
1	50.0°	52.1°	50.6°
3	49.7	51.6	49.9
6	49.4	51.1	50.0
9	49.3	50.4	50.0
12	49.9	50.2	50 7
24	53 8	53.9	54.8
36	56.4	56 3	56.0
48	58.7	58.1	57.3
60	60.0	....	60.0
72		61.0	
84		62.3	
96		63.9	

Stations.	Counties.	Altitude.	Latitude.	Longitude N.	BAROMETER. Monthly Mean	Max. Height.	Max. Date.	Min. Height.	Min. Date.	TEMPERATURE. Monthly mean.	Mean of Max.	Mean of Min.	Max. Height.	Max. Date.	Min. Height.	Min. Date.	Monthly R'nge	Me'n d'ly r'nge	Total precipitat'n	Clear Days.	Fair Days.	Cloudy Days.	Days of Rain.	Prevailing Wind.	Observers.
Selma	Dallas	...	32.28	87.	....	.....	..	.....	..	...	...	...	..	...	..	...	...	...	...	..	..	..	..	..	†
Valley Head	DeKalb	1031	34.34	85.37	....	.....	..	.....	..	42 4	53 7	31 1	68	2-23	20	4,28,29	48	22.6	3 84	15	3	13	5	N E	E. P. Nicholson.
Pine Apple	Wilcox.	...	31.35	87.	.....	.....	..	.....	..	...	...	...	..	...	..	...	...	...	...	..	..	..	..	..	†
Florence	Lauderdale.	..	34.48	87.37	.....	.....	..	.....	..	...	...	...	..	...	..	...	...	...	...	..	..	..	..	..	C. W. Ashcraft.
Chattanooga	Tenn	783	35.03	85.30	30 196	30 512	13	29 815	3	44 8	54 5	35 1	65	2	26	13	39	19 4	3 13	12	8	11	11	N w	L. M. Pindell.
Montgomery	Montgomery	219	32.22	86.23	30.198	30 470	28	29.873	3	51 1	61 6	41 7	73	5	29	13	44	19 9	1.85	13	11	7	4	N w	L. Dunne.
Marion	Perry	..	33.12	87.42	....	.....	..	.....	..	...	...	...	..	...	..	...	...	...	...	..	..	..	..	..	†
Union Spgs.	Bullock	516	32.12	83.39	....	.....	..	.....	..	...	...	...	..	...	..	...	...	...	...	..	..	..	..	..	R. J. Grady.
Bermuda	Monroe	...	31.43	87.12	.....	.....	..	.....	..	52	...	...	76	6	24	10	52	...	1.35	..	..	..	..	..	Wm. Fowler.
Mobile	Mobile	30	30.41	88.20	30 212	30.525	28	29 868	3	54 1	62 7	44.5	76	3	31	9	45	19.2	1.55	9	16	6	5	N	A. Pritchard.
Carrollton	Pickens	...	...	88.03	....	.....	..	.....	..	...	...	...	..	...	..	...	...	...	...	..	..	..	..	..	M. L. Stansel.
Auburn	Lee	826	32.40	85.30	30 345	30 632	28	29 950	3	50 1	58 7	41.4	70	7-22	28	3	41.5	17.3	2.62	16	9	6	3	N w	J. M. Quarles.
Livingston	Sumter	150	32.34	88 08	30.220	30 490	28	29 890	3	50.7	62	39 5	72	5	24	19	48	22.5	1.59	14	4	13	5	N w	J. W.A. Wright.
Greensboro	Hale	220	32.41	87.36	.....	.....	..	.....	..	48 3	..	...	69	23	28	28	41	...	3.37	0	17	14	3	N w	M. A. Yerby.
Mt. Willing.	Lowndes	...	32.07	86.45	.....	.....	..	.....	..	49.5	...	...	71	5	31	9-10	40	...	1.50	..	..	..	2	....	Wm. Garrett.
Uniontown	Perry	273	32.28	86 44	30,190	30.500	28	29 780	3	52 3	60 5	40 1	74	5	28	28	46	20 4	2.47	15	6	10	3	N w	W. H. Newman.
Citronelle	Mobile	352	31.03	87.30	.....	.....	..	.....	..	55.7	68.4	43	80	5-6	20	9	60	25 4	1.71	15	4	12	4	....	J. G. Michael.
Fayette C H	Fayette	...	33 42	83.12	.....	.....	..	.....	..	...	...	...	..	...	..	...	...	...	...	..	..	..	..	....	Daniel Collier.
Opelika	Lee	...	32.45	85.28	.....	.....	..	.....	..	...	...	...	..	...	..	...	...	...	...	..	..	..	..	....	†
Guntersville	Marshall	655	34.24	86.18	....	.....	..	.....	..	...	...	...	..	...	..	...	...	...	...	..	..	..	..	....	A. J. Baker.
Chepultepec	Blount	890	33.58	86.20	.....	.....	..	.....	..	...	...	...	..	...	..	...	...	...	...	..	..	..	..	....	W. B. Allgood.
Columbiana	Shelby	560	33 15	86.38	.....	.....	..	.....	..	46.5	59	34	69	2	22	19	47	25	1.91	..	..	..	3	....	W. D. Lovett.
Centre	Cherokee	728	34.10	85 42	.....	.....	..	.....	..	...	...	...	..	...	..	...	...	...	...	..	..	..	..	....	Thos. Bradford.
Double Spgs	Winston	...	34.08	85.35	.....	.....	..	.....	..	48 6	..	36.5	69	5	21	13	48	....	3 97	..	..	..	6	....	A. M. Weiler.
Butler	Choctaw	..	32.05	87.24	.....	.....	..	.....	..	...	...	...	..	...	..	...	...	...	...	..	..	..	..	....	B. F. Gilder.
Jasper	Walker	310	33.49	88.12	.....	.....	..	.....	..	...	...	...	..	...	..	...	...	...	...	..	..	..	..	....	Howard Lamar.
Tuscumbia	Colbert	...	34.42	87.38	.....	.....	..	.....	..	45 7	....	..	73	5	23	9	50	...	2.61	21	00	10	6	S w	L. B. Thornton.
Fort Deposit	Lowndes	...	34.42	86.39	.....	.....	..	.....	..	...	...	...	..	...	..	...	...	....	...	..	..	..	..	....	†
Piedmont	Calhoun	...	...	...	.....	.....	..	.....	..	...	...	...	..	...	..	...	...	...	...	..	..	..	..	....	R. Swaine Perry
Mt Home	Lawrence	...	...	...	.....	.....	..	.....	..	...	...	...	..	...	..	...	...	...	...	..	..	..	..	....	A. J. Weaver.
Bessemer	Jefferson	...	...	...	.....	.....	..	.....	..	47	55 8	38.2	65	22	24	28	41	17.6	1 58	..	..	..	5	....	Wm. Swan.
Brewton	Escambia	..	...	...	.....	.....	..	.....	..	58.2	72	44.4	91	5	23	10	68	27 6	1.70	..	..	..	..	....	W. J. Holland.
Wiggins	Covington	..	...	...	.....	.....	..	.....	..	...	...	...	..	...	..	...	...	...	...	..	..	..	..	N w	M. D. Jones.
Talladega	Talladega	...	...	...	.....	.....	..	.....	..	46.6	..	...	68	25	22	4-5	46	...	...	..	..	..	..	....	J. O. Huey.
Means	.....	....	...	...	30.227	.....	..	.....	..	49.5	60.9	39.1	...	...	...	...	44.7	21.5	2 30	13	8	10	5	....	