THIRTY-SEVENTH ANNUAL REPORT

Fiscal Year Ending June 30, 1926

OF THE

Agricultural Experiment Station

OF THE

Alabama Polytechnic Institute

AUBURN

M. J. FUNCHESS, *Director*

AUBURN, ALABAMA

ALABAMA POLYTECHNIC INSTITUTE

COLLEGE OF AGRICULTURE
AGRICULTURAL EXPERIMENT STATION

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EXPERIMENT STATION STAFF

Spright Dowell, A. M., LL.D., President
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W. H. Weidenbach, B. S., Secretary
P. O. Davis, B. S., Agricultural Editor
M. E. Martin, Librarian

Agronomy

M. J. Funchess, M. S.	Agronomist
F. W. Parker, Ph.D.	Soils Chemist
W. H. Pierre, Ph.D.	Associate Soil Chemist
J. T. Williamson, B. S.	Associate Agronomist
H. B. Tisdale, B. S.	Associate Plant Breeder
J. W. Tidmore, M. S.	Assistant in Agronomy
W. H. Appleton, M. S.	Assistant in Agronomy
W. W. Pate, B. S.	Assistant in Agronomy

Animal Industry

J. C. Grimes, M. S.	Animal Husbandman
John E. Ivey, M. S.	Poultry Husbandman
W. D. Salmon, M. A.	Assistant Animal Husbandman

Botany and Plant Pathology

W. A. Gardner, Ph.D.	Botanist
W. L. Blain, Ph.D.	Associate Plant Pathologist
Martin Palmer, B. S.	Assistant in Botany

Chemistry (Agricultural)

E. R. Miller, Ph.D.	Research Chemist
M. A. Barnes, B. S.	Assistant Research Chemist
E. F. Williams, B. S.	Assistant Research Chemist

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J. F. Duggar, M. S.	Agricultural Economist

Engineering (Agricultural)

M. L. Nichols, M. S.	Agricultural Engineer
C. D. Miller, Ph.D.	Associate Agricultural Engineer
J. W. Randolph, M. S.	Assistant Agricultural Engineer
E. C. Easter, M. S.,	Assistant Agricultural Engineer

Entomology

J. M. Robinson, M. A.	Acting Entomologist
H. G. Good, M. S.	Assistant Entomologist
F. E. Guyton, M. S.	Assistant Entomologist

Horticulture

C. L. Isbell, M. S.	Acting Horticulturist
W. D. Kimbrough, Ph.D.	Assistant Horticulturist
R. W. Taylor, B. S.	Assistant Horticulturist

Home Economics

Georgia W. Burton, Ph.D.	Research in Home Economics

Veterinary Medicine

C. A. Cary, B. S., D. V. M.	Veterinarian

CHANGES IN STATION STAFF

Appointments:

Georgia W. Burton, Ph.D.	Research in Home Economics
W. D. Kimbrough, Ph.D.	Assistant Horticulturist
W. H. Pierre, Ph.D.	Associate Soil Chemist
E. F. Williams, B. S.	Assistant in Research Chemistry
W. H. Weidenbach, B. S.	Secretary

Resignations:

J. H. Trapp, B. S.	Secretary
M. A. Barnes, B. S.	Assistant in Research Chemistry

TRANSMITTALS

President Spright Dowell,
Auburn, Alabama.

Dear Dr. Dowell:

I have the honor to submit herewith the Thirty-seventh Annual Report of the Agricultural Experiment Station of the Alabama Polytechnic Institute.

Yours very truly,

M. J. Funchess,
Director.

Alabama Polytechnic Institute
Auburn, Alabama

Governor W. W. Brandon,
Montgomery, Alabama

Dear Sir:

I take pleasure in transmitting to you the Thirty-seventh Annual Report of the Alabama Agricultural Experiment Station of the Alabama Polytechnic Institute.

Respectfully,

Spright Dowell,
President.

NEW FUNDS

DURING THE PERIOD covered by this report (July 1, 1925, to June 30, 1926) new funds became available through the passage of the Purnell Act by Congress. These additional funds, amounting to $20,000.00, made it possible to enlarge the experiment station staff, and to engage in new lines of research. Most of this new fund was devoted to research in home economics, poultry, soils and horticulture. This marks the beginning of research work in home economics and poultry.

The new research projects of major importance started on Purnell funds deal with (a) the effect of varying rates of various kinds of fertilizers on the production, storage and shipping qualities of certain truck crops; (b) the vitamin content of collards and turnip tops; (c) the relative value of a standard animal source of protein and certain vegetable proteins (cotton seed meal, peanut meal, etc.) in the ration of laying hens; and (d) the effect of certain nitrogenous fertilizers on the development of soil acidity in soils of different types.

The funds provided by the Purnell Act will increase by $10,000.00 each year, until the amount reaches a total of $60,000.00. The regular increase in the funds provided by the passage of this act permits the slow but careful expansion of the research program of the Experiment Station, and it is believed that this new research work will be of great assistance in formulating a better program in both resident and extension teaching work.

NEW PUBLICATIONS

The Decomposition of Toxins by Soil Organisms. W. A. Gardner (Alabama Experiment Station Bulletin 225.)

The purpose of this experiment was to determine some of the conditions for the growth of toxin decomposing organisms, to ascertain which toxins may be decomposed, and to learn the distribution of these organisms.

Protecting the Farm Against Fire. M. L. Nichols and T. B. Chambers (Alabama Experiment Station Circular 49).

This publication takes up a list of the common causes of farm fires with methods of prevention, including tests of farm water supply for fire protection.

Land Clearing in Alabama Bottom Lands. Rufus Godwin (Alabama Experiment Station Circular 50).

This circular draws conclusions from experiments in Fayette and Lamar counties, dealing with factors affecting economics of explosives.

Dusting Cotton with Calcium Arsenate for Boll Weevil Control. (Alabama Experiment Station Circular 51). J. M. Robinson.

This publication is a progress report of the work done during the growing seasons of 1924 and 1925 to control boll weevils with poison dust.

CONTRIBUTIONS TO SCIENTIFIC JOURNALS AND PERIODICALS

Appleton, W. H., and Helms, H. B.—*The Rate of Absorption of Nitrate of Soda by Oats and Cotton when applied at Different States of Plant Growth. Jour. Am. Soc. Agr.*, 17, 576-605. This work was conducted under the Chilean Nitrate Fellowship in Agronomy.

Greenhouse studies are reported showing that nitrate absorption is slow the first four weeks after planting. Nitrate applied six weeks after planting is absorbed rather rapidly.

Nichols, M. L., and Randolph, J. W.—*Method of Studying Stresses. Transactions of American Society of Agricultural Engineers* 1925, 134-135. A description of methods of studying force movements in soil by means of plaster casts of distortion.

Nichols, M. L.—*The Sliding of Metals Over Soil. Jour. Am. Soc. of Agr. Engineers,* 6, 80-84. Report on a study of the friction of common plow metals and soils, giving the effect of colloidal matter and outlining the general laws of friction between metal and soil.

Parker, F. W., and Pate, W. W.—*Base Exchange in Soil Colloids and the Availability of Exchangeable Calcium in Different Soils. Jour. Am. Soc. Agr.*, 18, 470-482. Results are presented indicating that base exchange is a property of soil colloids and that non-colloidal soil material does not possess this property. The relationship between chemical composition of soil colloids and their properties is suggested. A method is given for the estimation of the availability of exchangeable calcium.

Parker, F. W.—*The Absorption of Phosphate by Pasteur-Chamberland Filters. Soil Sci.*, 20, 149-158. Data are presented showing that Pasteur-Chamberland filters absorb phosphorus and are unsuitable for use in preparing soil extracts for the study of water soluble phosphate.

Parker, F. W.—*The Carbon Dioxide Content of the Soil Air as a Factor in the Absorption of Inorganic Elements by Plants. Soil Sci.*, 20, 39-44. Data are presented showing that the removal from or addition of carbon dioxide to the soil air did not influence the mineral composition of plants growing in the soil.

Parker, F. W., and Tidmore, J. W.—*The Influence of Lime and Phosphate Fertilizers on the Phosphorus Content of the Soil Solution and of Soil Extracts. Soil Sci.* 21, 425-443. The phosphate content of the soil solution and water extract of limed and unlimed

soils is reported. In nearly all instances liming has increased the phosphate content of both the soil solution and soil extracts.

Pate, W. W.—*The Influence of the Amount and Nature of the Replaceable Base upon the Heat of Wetting of Soils and Soil Colloids. Soil Sci.*, 20, 329-336. Studies are reported showing the influence of the exchangeable base on heat of wetting. In general soils saturated with mono-valent bases have a lower heat of wetting than when saturated with divalent bases. Colloids high in exchangeable bases have a high heat of wetting.

Randolph, J. W.—*Tractor Lug Studies on Sandy Soil. Jour. Am. Soc. of Agr. Engineers*, 7, 178-184. A summary of four years laboratory work showing the effect of weight, depth of lug and rim width on drawbar pull of a tractor.

Salmon, W. D.—*Vitamin B in the Excreta of Rats on a Diet Low in this Factor. Jour. Biol. Chem.*, 65, 457-462. Rats on a diet deficient in vitamin B made marked growth when they had access to their excreta. The excreta contained more vitamin B than does corn or oats. These facts must be taken into account in the technique for vitamin B tests.

Salmon, W. D., and Miller, E. R.—*The Water-Soluble Vitamin Content of the Velvet Bean. Jour. Agr. Res.* 31, 793-799. Small amounts of velvet beans protected pigeons against beriberi but large amounts were harmful. Rats grew at approximately one-third of the normal rate on diets containing 20 per cent of velvet beans as the sole source of vitamin B. The beans had an injurious effect on rats when the diet contained as much as 50 per cent of the ground seed. Cooking or autoclaving the beans lessened but did not entirely overcome their harmful effect.

Salmon, W.D., and Eaton, W. H.—*Effect of Bone Meal on Growth of Dairy Heifers. Journal Dairy Sci.*, 8, 312-317. The addition of 2 ounces of bone meal per animal per day did not have any effect on the growth in weight or height of Jersey or Holstein heifers.

AGRONOMY

Lime for Cotton and Corn. (J. T. Williamson).—During the past several years two cooperative experiments have been conducted to determine the value of lime for cotton and corn. One experiment near Berry, Fayette County, is on Hanceville sandy loam. The other experiment is near Northport, Tuscaloosa County, and is on Kalmia sandy loam. Both soils are medium in acidity as indicated by the Truog test and have a reaction of pH 5.5.

The results of the two experiments are given in Table 1. In the experiment at Berry, limestone with a complete fertilizer increased the yield 20 pounds of seed cotton. Without fertilizer

or when potash was omitted limestone did not produce a significant increase. Lime alone or with a complete fertilizer increased the yield of corn slightly more than 3.0 bushels in the test at Berry. In the experiment at Northport lime alone increased the yield of cotton 108 pounds; when used with a complete fertilizer the increase was only 43 pounds; and when potash was omitted, limestone decreased the yield of seed cotton 52 pounds. With corn, limestone gave the largest increase, 5.9 bushels, when used with a complete fertilizer.

Table 1.—Yield of Seed Cotton and Corn in Lime Test.

Plot No.	Fertilizer per Acre (Pounds)	Seed cotton		Corn	
		Berry (6 yr.) Lbs. per A.	Northport (5 yr.) Lbs. per A.	Berry (6 yr.) Bu. per A.	Northport (5 yr.) Bu. per A.
1	4000 Limestone	434	804	28.5	18.3
2	None	428	696	25.3	15.0
3	100 Nitrate of soda 240 Acid Phosphate	799	938	33.9	23.9
4	100 Nitrate of soda 240 Acid Phosphate 4000 Limestone	804	886	33.2	26.1
5	100 Nitrate of soda 240 Acid Phosphate 50 Muriate of potash	815	994	34.1	24.9
6	None	427	632	22.9	17.0
7	100 Nitrate of soda 240 Acid Phosphate 50 Muriate of potash 4000 Limestone	835	1037	37.6	30.8

Ground limestone was applied to the Berry experiment in 1919, and to the Northport experiment in 1921.

Rate of Fertilizing Cotton. (J. T. Williamson).—In 1923 cooperative experiments were started to determine the best rate of fertilizing cotton with nitrate of soda, acid phosphate and muriate of potash. The "Auburn Minimum," 100 pounds nitrate of soda, 200 pounds acid phosphate, and 25 pounds muriate of potash, was used as the lowest rate of application. On other plots the amount of these three fertilizer constituents was increased singly or in pairs. Finally one plot received double the "Auburn Minimum," frequently called the "Auburn Maximum".

Since 1923 one hundred seventy-nine of these cooperative experiments have been conducted. Sixty-nine tests were made during the past year. The most important results obtained may be summarized as follows:

The "Auburn Minimum" made a substantial profit on all except Black Belt soils.

On all except Houston and Trinity soils the "Auburn Maximum" was the most profitable fertilizer.

On every soil the second largest profit was obtained where 200 pounds of nitrate of soda were used.

The omission of any one of the three needed elements may act as a factor in limiting the yield.

Fertilizer Rotation Experiments. (J. T. Williamson).—In 1916 two rotation experiments were started, one on Greenville sandy loam at Jackson, the other on Dekalb sandy loam at Albertville. The rotation used is cotton, corn, and oats followed by cowpeas and crimson clover. The average of all results obtained is given in Tables 2 and 3. The data from the Albertville field for the first four years were destroyed by fire.

At Albertville a complete fertilizer, plot 6, produced an average increase of 381 pounds of seed cotton. When used with lime, plot 10, the increase was 489 pounds per acre. On the unlimed plots basic slag as a source of phosphorus produced better yields of both cotton and corn than did acid phosphate. On the limed plots the acid phosphate was slightly better than basic slag.

Liming on this field was very profitable. Two tons of lime, applied in 1916, produced an average increase of 108 pounds of seed cotton during the past six years.

The Jackson field is more fertile than the Albertville field as is shown by the yield on the check plots. The data show that a good increase was obtained from the use of all three fertilizer elements and limestone. On the unlimed land acid phosphate and basic slag produced almost the same yields of cotton and corn. On the limed plots, however, acid phosphate proved superior to basic slag for both cotton and corn.

Lime on the Jackson field has produced remarkable increases in the yield of cotton. As a ten-year average, lime increased the yield of seed cotton 164 pounds per acre per year. Thus, two tons of lime applied in 1916 produced a total increase of 1640 pounds of seed cotton. The increase due to liming was greater during the last five years than during the first five. There is no apparent need for reliming at the end of the 10 years. Lime on this field produced a very small decrease in the corn yields.

Table 2.—Fertilizer Rotation Experiment—Albertville. This Table Gives the Average of all Conclusive Results Obtained Since 1919.

Plot No.	Fertilizer		Seed cotton		Corn	
	Amount Lbs. per A.	Kind	6 year Average Lbs. per A.	Increase Lbs. per A.	6 year Average Bu. per A.	Increase Bu. per A.
1	None		128		12.2	
2	100 240	Nitrate of soda Acid phosphate	442	329	24.6	10.7
3	100 50 240	Nitrate of soda Muriate of potash Acid phosphate	223	110	21.8	7.9
4	50	Muriate of potash	259	146	21.9	8.0
5	None		99		13.4	
6	100 240 50	Nitrate of soda Acid phosphate Muriate of potash	494	381	25.5	11.6
7	100 240 50	Nitrate of soda Basic slag Muriate of potash	515	402	29.5	15.6

	100	Nitrate of soda				
	480	Rock phosphate				
8	50	Muriate of potash	392	279	27.4	13.5
9	None		110		16.2	
	100	Nitrate of soda				
	240	Acid phosphate				
	50	Muriate of potash				
10	4000	Limestone	602	489	29.2	15.3
	100	Nitrate of soda				
	240	Basic slag				
	50	Muriate of potash				
11	4000	Limestone	573	460	27.0	13.1
	100	Nitrate of soda				
	480	Rock phosphate				
	50	Muriate of potash				
12*	4000	Limestone	592	*	32.0	*
13*	None		213		21.5	

Limestone applied in 1916

*Plots 12 and 13 are on more fertile land. They are not considered in calculating the increases due to fertilization and liming.

Table 3.—Fertilizer Rotation Experiment—Jackson. This Table Gives the Average of all Conclusive Results Obtained Since 1916.

Plot No.	Fertilizer		Seed cotton		Corn	
	Amount Lbs. per A.	Kind	10 year Average Lbs. per A.	Increase Lbs. per A.	10 year Average Bu. per A.	Increase Bu. per A.
1	None		458		17.9	
	100	Nitrate of soda				
2	240	Acid phosphate	576	124	20.8	4.6
	100	Nitrate of soda				
3	50	Muriate of potash	540	88	19.7	3.5
	240	Acid phosphate				
4	50	Muriate of potash	629	177	20.0	3.8
5	None		436		16.4	
	100	Nitrate of soda				
	240	Acid phosphate				
6	50	Muriate of potash	699	247	21.5	5.3
	100	Nitrate of soda				
	240	Basic slag				
7	50	Muriate of potash	696	244	21.5	5.3
	100	Nitrate of soda				
	480	Rock phosphate				
8	50	Muriate of potash	662	210	20.9	4.7
9	None		466		15.7	
	100	Nitrate of soda				
	240	Acid phosphate				
	50	Muriate of potash				
10	4000	Limestone	863	411	20.5	4.3
	100	Nitrate of soda				
	240	Basic slag				
	50	Muriate of potash				
11	4000	Limestone	814	362	19.4	3.2
	100	Nitrate of soda				
	480	Rock phosphate				
	50	Muriate of potash				
12	4000	Limestone	716	264	18.9	2.7
13	None		448		14.9	

Limestone applied in 1916.

Experiment Fields. (J. T. Williamson).—The past year was the end of the first rotation on the experiment fields located near Hackleburg, Sylacauga, Cusseta, and Prattville. The Atmore field was discontinued after the 1924 crop and a new field started in the fall of 1925, near Pollard, Escambia County. The average of the three-years data shows:

That a complete fertilizer was needed for cotton on the soils of all of these fields.

That nitrogen was the most needed single element.

That lime increased the cotton yield sufficiently on every field to pay for the liming material during the first rotation. On the Sylacauga and the Atmore fields liming was highly profitable.

That on cotton, under the conditions of these experiments, basic slag was less effective than acid phosphate.

That cropping without a legume for only three years caused a slight decrease in the yield of cotton on all fields.

That the application of two-thirds of the minerals to the winter legume preceding cotton and the remaining one-third to cotton was a better practice than to apply all the minerals to the winter legume.

That 100 pounds of nitrate of soda per acre was highly profitable on oats.

That lime was helpful in the growth of summer legumes except at Sylacauga.

That lime caused a slight increase in the yield of corn on all fields.

Cotton Variety Tests. (J. T. Williamson).—Eight of these tests were made during the past year. Cook 1010, Cook 588, Acala No. 5, Cleveland (Piedmont), and Cook 307 (Bridges) have been the five leading varieties in seven tests in North Alabama since 1921. In Central Alabama, Cook 307 (Bridges), Dixie Triumph, Cook 588, Cleveland (Piedmont), and Cleveland (Wannamaker) have led in the average of six tests since 1921 on sandy soils; and Cook 1010, Cleveland (Piedmont), Cook 307 (Bridges), Dixie Triumph, and Bottoms, in the average of three tests since 1922 on Black Belt soils. The average of the South Alabama tests since 1921 on non-wilt land shows that Cleveland (Piedmont), Acala No. 5, Bottoms, College No. 1, and Cook 588 have been the leading five varieties.

Corn Variety Tests. (J. T. Williamson).—Corn variety tests in North Alabama, 1922-'25, inclusive, show that Weekley, Neal's Paymaster, Watson, Pee Dee No. 5, and Douthit have yielded best. In seven tests in South Alabama, Neal's Paymaster, Hastings, Whatley, Garrick and Watson have led.

Time of Applying Nitrate of Soda to Cotton. (W. H. Appleton).—Ten field experiments were conducted in different parts of the State to determine what effect the time of application of nitrate of soda has on the yield of seed cotton. The general procedure in each experiment was to fertilize twelve one-twentieth-acre plots with the same amounts of acid phosphate and muriate of potash, and all except the check plots with equal amounts of nitrate of soda. Acid phosphate and muriate of potash were applied at the rates of 400 and 50 pounds per acre respectively.

These materials were applied in the drill just before planting the cotton. Nitrate of soda, at the rate of 200 pounds per acre, was applied as indicated in Table 4.

Table 4 gives the average results for 4 experiments on sandy soils and for 6 experiments on heavy soils. The data show that on the sandy soils the highest yield and greatest increase from the use of nitrate of soda were obtained on plot 9, from the application of 100 pounds of nitrate of soda at planting and 100 pounds 35 days after planting. The yield of 833 pounds on this plot was 90 pounds greater than on plot 3 that received all of the nitrate of soda at planting, and 78 pounds greater than the yield of plot 5 that received all of the nitrate of soda 35 days after planting. The results further indicate that there is no advantage in supplying the nitrate of soda in three separate applications as was done on plot 11.

The results obtained on the heavy soils also show that 100 pounds of nitrate of soda at planting and 100 pounds 35 days after planting produce a higher yield than a single application of 200 pounds. On these soils the increased yield due to making two applications instead of one would be valued at $3.66 per acre if seed cotton had a value of six cents per pound. These soils show a slight increase of 12 pounds, due to making three applications of nitrate of soda instead of two. The difference, however, is so small that it would not pay for the additional labor.

The above results are in agreement with those previously obtained and reported from this station. They show the advantage of supplying the nitrate of soda in two applications.

Table 4.—Average Results Obtained from Applying Nitrate of Soda to Cotton at Different Stages of Growth.

Plot	Nitrate Fertilization		Sandy soils Ave. 4 experiments		Heavy soils Ave. 6 experiments	
No.	Amount lbs. per A.	Time of application	Yield lbs. per A	Increase lbs. per A.	Yield lbs. per A.	Increase lbs. per A.
1	0		482		451	
2	200	At planting (Bdc)	718	244	879	395
3	200	At planting (Drill)	743	269	881	397
4	0		464		462	
5	200	35 days after planting	755	281	885	401
6	200	65 days after planting	706	232	687	203
	100	35 days after planting				
7	100	65 days after planting	693	219	830	346
8	0		450		526	
	100	At planting				
9	100	35 days after planting	833	359	946	462
	100	At planting				
10	100	65 days after planting	756	282	941	457
	67	At planting				
	67	35 days after planting				
11	67	65 days after planting	800	326	958	474
12	0		498		498	

Soil Colloids and Base Exchange. (F. W. Parker and W. W. Pate).—During the past year colloids have been extracted from fourteen soils and their properties studied. The data indicate that only the colloid fraction of a soil possesses the property of base exchange and that there was a good correlation between the chemical composition of the colloid and its base exchange capacity. Work of a preliminary nature also indicated a correlation between the buffer capacity of soils and soil colloids and their content of exchangeable bases. The availability of exchangeable calcium can be determined by a method described in a publication from this laboratory. It was found that, in general, the availability of exchangeable calcium was dependent on the H-ion of the soil.

The Influence of Liming on the Phosphate and Potash Content of the Soil Solution. (F. W. Parker and J. W. Tidmore).—Studies have been made with the soils from field experiments in several states. Liming increased the phosphate content of the soil solution and of the extracts from untreated soils or soils receiving acid phosphate or basic slag. The influence of lime on the solubility of rock phosphate was not great—in some cases it apparently increased and in others it reduced the availability of rock phosphate. Liming had a very decidedly depressing effect on the solubility of phosphorus in steamed bone meal. The results of a prolonged dialysis experiment show that the soil has a remarkable capacity to renew the phosphate concentration of the soil solution or of a soil extract.

A rather limited amount of data indicate that liming will frequently reduce the potash content of the displaced soil solution.

Phosphorus Nutrition of Plants. (F. W. Parker).—The average phosphate content of the soil solution from 20 soils was found to be 0.09 parts per million inorganic PO_4, and 0.47 parts per million of organic PO_4. The displaced solution from several productive soils contained less than 0.05 parts per million inorganic PO_4. Absorption studies with corn and soybeans showed that the organic phosphate was not absorbed by the plant so that from the standpoint of plant nutrition only the inorganic phosphate should be considered. In culture solution studies one corn plant was grown in 7500 cc. of solution and the PO_4 content of the solution was renewed twice a day. Absorption studies showed that even with that procedure the PO_4 content of the solution was not maintained constant. Maximum growth of corn was secured at a phosphate concentration of 0.50 parts per million of PO_4. Growth of 0.05, 0.10, and 0.25 parts per million of PO_4 was respectively 19 per cent, 37 per cent, and 71 per cent of the maximum. These results indicate that if the PO_4 content of the culture solutions was maintained constant, maximum growth of corn might be secured at a concentration of 0.20 parts per million of PO_4.

A Comparison of Different Nitrogenous Fertilizers and Their Influence on Soil Reaction. (W. H. Pierre).—Field experiments have been started at Auburn and Lafayette, Alabama, and with four cooperating stations. The field experiments include a comparison of nitrate of soda, sulfate of ammonia, Leunasalpeter, urea, Ammo-Phos, and Cyanamid on limed and unlimed land. Lime is to be applied as acidity develops instead of at a uniform rate on all plots.

Laboratory and greenhouse studies have been started to determine the relative acidifying effect of different sources of nitrogen. The study also includes experiments to determine the amount of lime necessary, and the possibility of combining certain fertilizers, to correct or avoid the acidity developed from different nitrogenous fertilizers. Good progress has been made toward the solution of some of these problems but the experiments have not gone long enough to give conclusive results.

A method has been developed for the determination of the buffer capacity of soils. Experiments have shown a correlation between the buffer capacity of soils and the amount of ammonium sulfate required to produce a given pH value. There are wide variations in the buffer action of Alabama soils. Some of the heavier soils have ten times the buffer capacity of our lighter sandy soils.

ANIMAL INDUSTRY

Winter Feeding and Time of Marketing Steers. (J. C. Grimes).— The study of "Winter Feeding and Time of Marketing" was continued. The results indicate that it is more profitable to limit the winter ration and finish steers on grass alone for the June market than it is to feed full ration during the winter and market in the spring, or to limit the winter ration and feed cottonseed meal on grass during the summer.

It did not pay to supplement a ration of cottonseed meal and Johnson grass hay with blackstrap molasses for steers that were being fattened for spring market. The steers receiving molasses made a larger daily gain, and carried somewhat more finish, but the cost per hundred weight gain was greater, and the steers did not sell for a sufficient premium to justify the extra expense involved. It did not prove profitable to feed cottonseed meal to steers that were being finished on grass for the June market.

Forage Crops for Fattening Hogs. (J. C. Grimes.)—Thirty hogs, averaging about 80 pounds, were divided into three lots of ten hogs each and fed as follows:

Lot I. Dry Lot—Corn and tankage, self fed, free choice.
Lot II. Oat and vetch pasture—Corn and tankage, self fed, free choice.
Lot III. Oat and vetch pasture—Corn and tankage (9 parts corn to 1 part tankage) hand fed, at the rate of 3 per cent live weight of animal.

Lots II and III had the run of three-fourths of an acre each of oats and vetch pasture. This amount of pasture furnished ample grazing for the hogs during the entire 56 day test, and a good crop of vetch was left on the land which was turned under at the close of the experiment for soil improvement.

The results of the test are briefly summarized in the table below.

Table 5.—*Results of Experiment with Forage Crop for Fattening Hogs*

	Lot 1	Lot II	Lot III
No. hogs in experiment:	10	10	10
Av. feeding period in days:	56	56	56
Initial weight of lot, lbs.:	806	806	802
Av. daily gain per pig, lbs.:	1.65	2.13	1.9
Amt. feed per 100 Wt. gain, lbs.:	463.7	367	396
Feed cost per 100 Wt. gain:	$8.75	$6.85	$7.55
Av. profit per pig above feed cost:	$5.65	$8.95	$7.59

The hogs in Lot 1 (self fed in dry lot) consumed 4,308 pounds of corn and tankage during 56 days. They gained 929 pounds, or 1.65 pounds per day. Lot 11 (self fed on pasture) consumed 4,382 pounds of corn and tankage and gained 1,194 pounds or 2.03 pounds per day. Lot III (hand fed on pasture) consumed 4, 167 pounds of corn and tankage and gained 1,050 pounds or 1.9 pounds per day.

Soft Pork. (J. C. Grimes and W. D. Salmon).—Work on the soft pork project was continued. A report of previous work has been published in U. S. D. A. Bulletin No. 1407.

This year twenty hogs were finished on corn and soy beans hogged off in the field. The corn and soy beans (Mammoth yellow variety) were planted in alternate rows three feet apart. The season was extremely dry which caused a rather low yield, the corn being damaged more than the beans. The hogs averaged 111 pounds when turned into the field and 200 pounds when they came out, having made an average daily gain of 2.15 pounds per hog through a period of 46 days. The average yield of pork per acre was 235 pounds.

The hogs were shipped to Beltsville, Maryland, for slaughter and the carcasses found to be very satisfactory. All the carcasses were hard or medium hard except one which was medium soft. The results show that a combination of corn and soy beans is an excellent crop for hogging off purposes.

Minerals in the Dairy Ration. (W. D. Salmon and W. H. Eaton)— The study of the effect of minerals in the ration of dairy cows and calves was continued. Thirteen calves were dropped by the cows in this experiment this year. On the non-mineral group, 5 calves averaged 63.8 pounds at birth. In the bone meal group, 5 calves averaged 61.2 pounds; in the marble dust group, 3 calves averaged 65 pounds. Apparently, the feeding of the minerals to mature cows did not affect the rate

of growth of these calves during the first 3 to 8 months after birth.

During the past year, the average milk production per cow for the various groups was as follows:

Non-mineral	6 cows	4,915 lbs.
Bone Meal	6 cows	6,194 lbs.
Marble Dust	5 cows	5,685 lbs.

It is apparent that the cows in both of the mineral groups had an average production that is considerably larger than the average of the cows that did not receive added minerals. It is possible, however, that this was due as much to the individuality of the cows as to the differences in the ration.

The Effect of Minerals on Growth, Reproduction, and Body Composition. (W. D. Salmon).—The basal diet of corn 30, wheat 30, peanut meal 25, blood meal 12, and cod liver oil 3, as proposed in the project outlined has proven to be unsatisfactory for the studies on the effect of minerals. Blood meal apparently is frequently contaminated with bone scraps which furnish sufficient ash to enable rats to grow at a rate approaching normal. Some of the females reproduced on the basal diet without the addition of minerals.

It is necessary, therefore, to do considerable work in an effort to find a diet that would have a low mineral content but that would be otherwise adequate for normal nutrition. This work is still in progress and there is not yet sufficient conclusive data to be reported.

Factors Affecting the Vitamin B content of Plant Products. (W. D. Salmon).—It was reported last year that different samples of velvet beans varied considerably in their content of vitamin B. A study of the relation of the age of the seed to the amount of vitamin B contained has been made this year. The studies have included tests with pigeons on velvet bean seed from the 1919, 1921, 1923, 1924, and 1925 crops. It was found that when the beans were fed within a few months after they were harvested 0.79 grams of beans daily per 100 grams live weight of the bird was sufficient to protect the bird against the onset of polyneuritis. The maintenance dose of one-year-old beans was about 1.10 grams per 100 grams live weight and of three-year-oid beans about 1.50 grams per 100 grams live weight.

The sample of 1919 beans was not large enough to permit the establishment of the minimum protective dose but it was at least larger than the required dose of 1921 beans. The sample of beans from the 1924 crop was tested in the fall of 1924 and the spring of 1925, and again in the spring of 1926. The protective dose was larger in 1926 than it had been for these beans a year earlier. This proves conclusively that there was a loss of vitamin and indicates that the variation observed in the other samples was due to the different ages of the beans.

The same samples of beans have been tested on a large num-

ber of rats. Again it was found that as the beans became older larger amounts are required to furnish sufficient vitamin B to maintain rats when the beans serve as the sole source of vitamin B.

Soybeans have been tested and no significant differences in the vitamin B contents of soybeans of different ages could be detected.

The leaves of the velvet bean and rape are apparently decidedly more efficient than the seed of the velvet bean in promoting the growth of rats, but are much less efficient than the seed in protecting pigeons against beriberi. The data seem to indicate that the factor which causes gains in weight of rats or pigeons is different from the factor which prevents the occurence of symptons of neuritis in either animal.

BOTANY

Physiology of Sweet Potatoes. (Wright A. Gardner).—In the investigation of the physiology of sweet potatoes a study of the changes occurring at 8°C., 13°C., and 18°C., was made, and the keeping qualities observed. It was found that sweet potatoes kept better at 13°C., than at either 8°C., or 18°C., and underwent changes in composition at 13°C., which were intermediate to those at 8°C., or18°C. A study of the shrinkage of sweet potatoes during curing and storage showed a total shrinkage of 7.5 per cent during curing which increased to more than 10 per cent during the first two weeks in storage. The application of the corresponding corrections to analytical data emphasizes the changes during the curing process but does not materially modify the course of the changes during storage. An attempt to test effects of ventilating banks, was perverted into a test of effect of storage in a wet ventilated bank and a dry ventilated bank. Results showed a marked advantage for the dry ventilated bank.

The Decomposition of Chlorophyll in the Rinds of Satsuma Oranges. (Wright A. Gardner).—The chief contributions of the year from the work on the decomposition of chlorophyll are: The demonstration of an enzyme in California oranges able to decompose cowpea chlorophyll; the determination of its critical temperatures, viz; thermal death point, 75°-80°., optimum, about 45°C,. minimun, 3°-27°C.,and maximum 60°-75°C.; the activation by means of oxygen of an enzyme in the rinds of cucumbers able to decompose cowpea chlorophyll; determination of the tolerance of the chlorophyll decomposing enzyme of oranges for several chemicals commonly used in enzyme work.

Disease Resistance in Sweet Potatoes. (Walter L. Blain).—Greenhouse soil was inoculated with the sweet potato black rot organism by grinding up potatoes badly infected with this disease in a food chopper. This ground up sweet potato material

was strewn to a depth of two inches in rows in which slips were to be placed. Plants of 25 strains of potatoes from selections from Mayaguez, Poro Rico, showed no signs of black-rot infection after being grown in the infected material for seven months. Only a little preliminary work was done on the resistance to stem rot infection.

Pecan Scab. (Walter L. Blain).—The pecan scab organism (*Fusicladium effusum*) was isolated from the Delmas variety, and grown in pure culture.

Control of Scab by Means of Sprays. (Walter L. Blain).—The results of the year's work show that pecan scab can be commercially controlled on Delmas and other very susceptible varieties of pecans if the spray outfit is large enough to completely and thoroughly cover each and every nut cluster, and if the spray is applied at sufficiently short intervals.

CHEMISTRY (Agricultural)

Velvet Bean Ration for Brood Sows. (Emerson R. Miller, J. C. Grimes).—On a ration of cooked velvet beans with addition of sodium chloride, calcium carbonate, yeast and cod liver oil a Duroc sow, as her eighth litter on a velvet bean ration, farrowed 10 live pigs and 6 dead ones, average birth weight 1.93 pounds. The sow raised 7 pigs which averaged 19.75 pounds at the age of 8 weeks.

This result was practically the same as that of the seventh litter, in which, however, it was necessary to feed some normal ration to induce the sow to eat the raw velvet beans.

This same sow on ration of cooked velvet beans supplemented as usual with mineral matter and cod liver oil, but with 10 per cent casein instead of yeast, farrowed as her ninth litter, 10 live pigs and 2 dead ones, average birth weight 2.05 pounds. One died from exposure. The sow raised 9 which averaged 25.5 pounds at the age of 8 weeks. These pigs appeared to have more vitality than those of other litters and were the best litter produced on a ration containing so large a quantity of velvet beans.

During the suckling period the sow's ration was varied. As the average weekly gain of the pigs for the fifth week was considerably less than that of the fourth week the sow's ration was changed at this point by substituting 10 per cent of dry yeast for the casein. The average weekly gain for the sixth week (yeast) was 3.07 pounds as compared with 2.54 pounds for the fourth week and 1.4 pounds for the fifth week. During the sixth week the pigs ate considerably more of the sow's ration than before.

At the end of the sixth week the yeast was discontinued and the casein raised to 15 percent. The average gain this week was 4.87 pounds. During the eighth week the casein was

discontinued and 15 percent of dry yeast used instead. The average gain of the pigs this week was 3.15 pounds as compared with 4.87 pounds of the seventh week when the sow had 15 per cent casein. In order to render the growth promoting vitamin inactive all the casein used was previously heated to 130°C. for five hours.

In this experiment the beneficial influence of the casein is quite apparent and seem to indicate that one of the deficiencies of the velvet bean is the character of its protein.

Velvet Bean Ration for Pigs. (Emerson R. Miller, J. C. Grimes).—The pigs from the ninth Duroc litter were weaned at the age of 8 weeks and put on rations as follows:

Two on normal ration.
Two on cooked velvet beans and normal ration 1:1.
Two on cooked velvet beans and normal ration 1:1 with the addition of skim milk.
Two on normal ration with addition of skim milk.
One on cooked velvet beans plus casein.
In the following table are given the averages for the 4 groups of two each and data for the one pig.
The experiment was continued 5 months. Following is a record:

Table 6.—Results of Experiment in Feeding Velvet Beans to Pigs

Ration	Initial weight	Final weight	Total gain	Per cent gain	Total feed	Feed for 100 lb. gain
Normal	26.875	157.5	130.625	486.04	458 lbs.	350.75
Cooked v.b. n: r. 1:1	25.00	159.0	134.00	536.00	427.50 lbs.	319.52
Cooked v. b. n. r. 1:1 skim milk	24.75	166.50	141.87	573.21	401.5 lbs. †65 gal milk	283.14
Normal skim milk	25.93	180.50	154.56	596.06	480 lbs. †40 gal milk	310.54
Cooked v. b.	24.375	180.00	155.625	638.46	490.25 lbs.	315.02

†Casein

This is the first experiment in which young pigs could be induced to eat a ration containing as much as 50 per cent of velvet beans. When raw beans were used 20 per cent to 25 per cent was the most that could be used.

These results show that the pigs getting 50 per cent cooked beans and 50 per cent normal ration made better gains than those getting only normal ration.

The two on a ration of cooked velvet beans and normal ration 1:1 with the addition of skim milk compared very favorably with those receiving normal ration and skim milk.

The pig receiving casein was fed a ration of cooked velvet beans supplemented by 15 per cent casein at the beginning of the experiment but it was necessary to reduce the quantity of velvet beans to 50 per cent. This was done by addition of normal ration. This pig did about as well as those on normal ration, but in the first part of the experiment made greater gains than any of the others.

The Antineuritic Substance of the Velvet Bean, Probably an Organic Base. (Emerson R. Miller, E. F. Williams).—There has been separated from the velvet bean a small amount of a basic substance which appears to have antineuritic properties.

Small amounts of this substance, though not pure, brought about marked improvement in pigeons having pronounced symptoms of polyneuritis though none were cured.

Since the above experiment was carried out there has been obtained a small amount of a base in fairly pure form, but not in sufficient quantity for further experiments with pigeons.

ENGINEERING (Agricultural)

Soil Dynamics. (M. L. Nichols).—Studies were made of the mechanical properties of soil as they affect implement design, with a view to handling the extremely sticky and tenacious soils of the State.

From the studies made it seems possible to lay down tentatively certain fudamental laws for sliding friction between a metal surface and the soil, remembering that these hold only between certain limits.

A. Friction Phase.—In a dry soil if the soil does not wet the slider and the bearing power of a soil is less than the pressure, the coefficient of sliding friction (U') varies with the speed, the pressure per unit area, the smoothness of the surface, and the materials of the surface.

B. Friction Phase.—If the bearing power of a soil is greater than the pressure per unit area and the slider does not get wet, the magnitude of the friction is proportional to the total pressure between the two surfaces. The value of U' depends upon the smoothness of the surfaces, and the materials of the surfaces but it is independent of the area of contact and of the speed of sliding.

C. Stiction Phase.—If there is enough moisture present to cause the soil to adhere to the sliding surface, but not enough to leave moisture brought to the surface, then U' varies with the speed, the area of contact, the pressure per unit area, the surface tension of the film moisture, and with the surface and kind of metal.

D. Sliction Phase.—If there is enough moisture present to give lubricating effect, U' varies with the pressure per unit area, the speed, the moisture content, the viscosity, and with the smoothness of the surface and kind of material of which the surface is composed.

It will be seen that the coefficient of sliding friction is a dynamic and constantly varying factor rather than a fixed quantity and that in any soil it is affected by moisture content and particular size. The importance of these factors in prac-

tical plow design is obvious. In the 'A' phase the shape that would give the lowest surface speed of soil over the metal surface and the lowest pressure per unit area of contact would give the least frictional resistance. Soils of this nature are usually worked with a steep moldboard plow, which is exactly the opposite to what frictional laws seem to indicate is advisable.

Sterilization of Dairy Utensils. (M. L. Nichols.—**Electrical equipment for sterilization of dairy utensils was installed at the creamery on the college farm. This consisted of a 600 watt heater attached to a 20 gallon hot water tank. It furnished an abundance of low pressure steam and hot water for washing dairy utensils. The electrical equipment was installed on November 1, 1924, and to January 1, 1926 consumed 7220 K.W.H. or approximately 500 K. W. H. per month. At a flat rate of 4 cents per K.W.H. This would be $20.00 per month. Eighty-six hundred gallons were heated to boiling with a current consumption of .84 K. W. H. per gallon. At four cents per K.W.H. the cost of heating was 3.36 cents per gallon.**

Milk Cooling. (M. L. Nichols, E. P. McDonald).—In cooperation with the Animal Industry Department, experimental studies were made in cooling and storing milk. A small refrigerator, operated by 1-4 H. P. motor and connected to a well insulated box partly filled with 15 per cent brine solution, was used for cooling and storing the milk.

An average of 8 gallons of milk per day was cooled in the above tank for 25 consecutive days during the hottest weather of the summer. The time required to cool the milk from 95°F. to 50°F. was 30 minutes, to 40°F. in one hour, and to 30°F. two hours. This milk was stored in the box at 30°F. for an average of 12 hours each day. The average atmospheric temperature for the 25 days was about 85°F. The electrical energy required to cool and store 200 gallons of milk for twenty hours was 53 K. W. H., an average of 0.275 K.W.H. per gallon of milk.

A Study of the Fundamental Factors Influencing the Traction of Wheel Tractors. (J. W. Randolph and M. L. Nichols). The factors found to be of importance in the laboratory studies of traction on a static wheel were tested in the field. Three standard tractors were tested with several combinations of lug equipment. Results in the field verified the results in the laboratory.

By varying the lug and wheel equipment the power of tractors was increased over that obtained with standard equipment. This is shown in the Table which follows:

Table 7.—Standard Tractor Vs. Tractor with Lug and Wheel Variations

Tractor	Lug Equipment	Rim width	Drawbar pull	Horse power
McCormick-Deering 10-20	4″ angle (Standard)	12″	1056	4.71
	4″ angle	18	1310	7.76
	5″ Spade	18	1630	9.16
Fordson	3″ angle (Standard)	12	859	3.74
	6″ angle	12	1463	6.36
	3″ angle	36	1780	9.52

ENTOMOLOGY

Boll Weevil Hibernation. (J. M. Robinson).—Twenty-seven hundred (2700) boll weevils were placed in the hibernation cage in the fall of 1925. The total number of boll weevils that emerged in the spring of 1926 was 36, or 1.3 per cent.

Control of Turnip Webworm, Hellula undalis. (J. M. Robinson).—Tests were made with sodium fluosilicate and different dilutions of calcium arsenate to control the larvae of the turnip webworm on collards. Four applications of sodium fluosilicate made at weekly intervals reduced the larvae from 28 to 15 per ten plants. There was only slight burning of the foliage after the fourth application. The undusted advanced from 51 to 100 larvae per ten plants. The infestation dropped to 5 larvae and then remained at 2 larvae for the next two weeks. Approximately the same control was obtained when calcium arsenate was diluted with equal parts of lime as when calcium arsenate was used commercial strength. Table—showing materials, record of living larvae and leaf burning follows:

Tablet 8.—Showing Materials, Record of Living Larvae, and Leaf Burn.

Plots	1		2	3		4		5	
Date Dusted	Sodium Fluosilicate 1 lb. Hydrated Lime 9 lb.		Check	Calcium Arsenate 1 lb. Hydrated Lime 9 lb.		Calcium Arsenate 5 lb. Hydrated Lime 5 lb.		Calcium Arsenate	
	Living Larvae	Leaves Burned	Living Larvae	Living Larvae	Leaves Burned	Living Larvae	Leaves Burned	Living Larvae	Leaves Burned
8/6	28	No	51	28	No	22	No	11	No
8/13	40	No	89	26	No	9	No	5	No
8/20	23	No	51	23	No	4	No	2	No
8/27	15	Slight	100	11	No	5	No	2	No
9/3	0	Plants dead	0	0	Leaves dead. Larvae in stalk	75% of plants dead	Larvae in stalk		50% of plants dead

Cotton Boll Weevil Control. (J. M. Robinson).—The work on boll weevil control was continued in 1925 on three types of soil,—namely, Norfolk Sandy Loam, Cecil Red Clay, and Houston Clay. On the sandy loam plots at Auburn under severe

drouth conditions no dusting was really needed to control the boll weevil. On the heavy red clay land two series of three dustings were necessary to protect the cotton.

The gain from dusting was 260 pounds of seed cotton per acre. Under black belt conditions seven applications of dust were necessary to protect the young squares and bolls. There were two distinct series of dusting. Each series consisted of three applications of six pounds of calcium arsenate per acre at four to five day intervals. A seventh application was made to protect the young bolls. The gain from dusting was 420 pounds of seed cotton per acre.

FARM MANAGEMENT

Causes of Failure of Alfalfa in the Central Prairie Region. (J. F. Duggar).—To ascertain whether a lack of plant food may be one of the causes of the failures often reported in recent years alfalfa of three different ages received separately in March, top dressings of three kinds of phosphate and certain other fertilizers.

Where the plants growing on gray prairie upland were a year old when fertilized, the yield was greatly increased by all three phosphates, acid, basic, and ground rock. The increase attributed to 800 pounds acid phosphate per acre used alone was 1990 pounds of hay per acre during this extremely dry season. The other fertilizers tested, including sulphur, were of but slight value under these conditions.

Methods of Cotton Picking to Improve the Product. (J. F. Duggar).—Heavy rains soon after cotton opened in 1925 caused many locks to fall to the ground. In fields in several counties of East Alabama account was kept of the cost of picking white and stained cotton, in separate operations. The difference in cost was found to be small enough to justify the separate picking of the two classes of cotton under these conditions. This separation resulted in greatly improving the grade of the bulk of the crop thus harvested.

An Intensive Study of Winter Legumes. (J. F .Duggar).—Variations in the weather conditions encountered by the plants at different stages of development were secured by planting an extensive collection of vetches, winter peas, true clovers, bur clovers, alfalfas and sweet clovers at different dates from September to February. Each kind was harvested at several stages of growth. With few exceptions, the yield of dry forage decreased as the date of planting was delayed.

Weather conditions were summarized for each period of growth of each species. Most kinds, when planted as usual in the fall, proved winter hardy under the weather conditions of the winter of 1924-25. A few, as purple vetch, were injured at certain stages of growth by a temperature of 22°F., but were

resistant to the same temperature at other ages. California bur clover was among the kinds killed at various stages of growth by a temperature of 9°F.

The seedlings of many legumes from the several dates of planting were frequently examined. In general the time between the coming up of the seedlings and the appearance of one nodule or more on nearly every individual plant was short in warm weather and long in cool weather. Different species of vetches differed notably in the promptness with their nodules developed under the same conditions.

In general the blooming dates of winter legumes, grasses, and grains were nearer together than the planting dates. That is, delay in planting did not proportionately retard the date of blooming or heading.

HORTICULTURE

Apple Variety Test, Talladega County. (R. W. Taylor, C. L. Isbell.—This test is on a stiff red clay soil. Information concerning the growth and production of the trees at the end of the sixth growing season 1925 is summarized in Table 9, following:

Table 9.—*Record of Apple Variety Test*

Variety	Per cent trees lost since planting	Average cir. of trunk in ins., 6 ins., from surface of ground	Average production per tree in lbs. fruit. 1925
Winesap	18	7.7	12.3
Stayman	25	7.7	6.1
Red June	16	7.1	——
Golden Delicious	33	7.0	6.1
Delicious	27	6.8	5.3
Red Astrachan	19	6.7	14.1
Hackworth	36	6.3	6.8

In an orchard under observation in Limestone County, which was rather low sandy soil, it was observed that trees of the Red June variety were leading in amount of tree growth; the Hackworth made the least growth. The orchard was set in 1917.

Pecan Variety Test at Auburn. (C. L. Isbell).—Dry weather during the growing season of 1925 prevented pecan trees in this test from making any second growth. The nuts failed to size and fill well on trees of the Success variety that were growing in soil that became very dry.

Pecan Variety Test, Marshall County. (R. W. Taylor, C. L. Isbell).—During the winter of 1924-25 a planting was made at Albertville, Alabama, on sandy loam soil. Twenty-two varieties were included in the planting. The object of the test was to determine the varieties best suited to North Alabama conditions.

Studies of the Fruit Bud Formation of the Pecan and the Growing Habits Associated With It. (C. L. Isbell).—The behavior of true terminal buds and of the influence of disbudding shoots that fruited the previous year were studied and the following observations and conclusions made: True terminal buds seldom contain catkins that mature; normally most of the vegetative growth and pistilate flower production arise out of buds located at nodes near the terminal part of a shoot, but all varieties studied may fruit out of terminal buds and such buds may furnish many pistilate flowers some years on certain varieties such as the Delmas; when the first two buds arising at a given node are removed in the spring following their formation the third usually does not have pistillate flower possibilities; the removal of the first and second formed buds at the first six nodes below the nut scar shifts the fruiting possibilities to more basal buds in general, but where one bud is removed it tends to scatter fruiting and vegetative growth over the entire shoot; removing the first and second buds at the first six nodes below the nut scar between March 15 and April 15 caused more shoots to be productive than normal, and actually increased nut production in the case of the Stuart.

Irish Potato Fertilizer Experiments, Escambia County. (R. W. Taylor, C. L. Isbell).—Complete fertilizer was compared with fertilizers that carried nitrogen and potash and nitrogen derived from nitrate of soda, cottonseed meal, ammonium sulphate, and dried blood, applied before plants were set. Comparisons were made on Norfolk and Orangeburg fine sandy loam soils.

Complete fertilizer gave better yields than where potash or phosphate was omitted from the fertilizer. The response to acid phosphate was greater on Norfolk fine sandy loam than on Orangeburg fine sandy loam. On the basis of equivalent nitrogen content, nitrate of soda did not give as high a yield before planting. On an average, dried blood gave identical yields with cottonseed meal. When all of the nitrate of soda was applied before planting, higher yields were obtained than when part was applied as a side dressing. This was probably due to the lack of rainfall after planting.

Cabbage Fertilizer Experiments, Mobile County. (R. W. Taylor, C. L .Isbell).—Cottonseed meal was compared with nitrate of soda, and muriate of potash with sulphate of potash, for one year on four farms. Compared on the basis of nitrogen content, cottonseed meal gave higher yields than nitrate of soda, both being applied before plants were set. Muriate of potash produced higher yields than sulphate of potash. All yields were small because of extreme drought.