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OF THE

Agricultural Experiment Station

OF THE

Alabama Polytechnic Institute

AUBURN

M. J. FUNCHESS, *Director*

AUBURN, ALA.

Contents

ALABAMA POLYTECHNIC INSTITUTE

COLLEGE OF AGRICULTURE

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*On leave.

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B. F. Alvord, M.S.	Head Agricultural Economics
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Edith M. Slights	Statistical Assistant

Agricultural Engineering:

*M. L. Nichols, M.S.	Head Agricultural Engineering
A. Carnes, M.S.	Acting Head Agricultural Engineering
J. W. Randolph, M.S.	Agricultural Engineer (Coop. U.S.D.A.)
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Special Investigations:

J. F. Duggar, M.S.	Research Professor of Special Investigations

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Donald J. Weddell, M.S.	Assistant Forester

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Harold Yates, B.S.	Acting Supt. Gulf Coast Substation, Fairhope, Ala.

CHANGES IN STATION STAFF DURING 1934-35

Appointments:

B. F. Alvord, M.S.	Agricultural Economist
A. Carnes, M.S.	Acting Agricultural Engineer
R. E. Yoder, Ph.D.	Assistant Agricultural Engineer
Fred Kummer, B.S.	Assistant in Agricultural Engineering
B. C. Small, B.S.	Graduate Assistant
H. S. Peters, M.S.	Associate Biologist (Coop. U. S. Bureau of Biological Survey and the State Dept. of Conservation).

Resignations:

F. E. Bertram, B.S.	Assistant in Agronomy
F. L. Davis, M.A.	Soil Chemist (Coop. State Dept. of Agri. & Ind.)
G. H. Jester, B.S.	Assistant in Agronomy
E. C. Richardson, M.S.	Graduate Assistant
J. D. Pope	Agricultural Economist
T. P. Whitten, M.S.	Graduate Assistant
C. L. McIntyre, B.S.	Assistant to Supt. of Black Belt Substation

*On leave.

**In cooperation with State Department of Conservation and U. S. Bureau of Biological Survey.

NEW PUBLICATIONS

Mayton, E. L.—**Permanent Pasture Studies on Upland Soils.** *Alabama Agricultural Experiment Station Bulletin 243.* The results of studies on the effects of fertilizer treatments and different pasture mixtures on the yields of pasturage produced on an upland Norfolk sandy loam soil are presented.

Agronomy and Soils Staff.—**Grades of Fertilizers for Corn and Cotton.** *Alabama Agricultural Experiment Station Circular 70.* The results of field tests to determine the best grade of fertilizer for corn and cotton are reported. Phosphate and potash did not increase corn yields, whereas 36 pounds of nitrogen per acre increased the corn yields approximately 17 bushels. For cotton, a 6-8-4 fertilizer produced cotton more economically than any other grade used in the test.

Grimes, J. C., Sewell, W. E., and Cottier, G. J.—**Wintering Steers in the Black Belt of Alabama.** *Alabama Agricultural Experiment Station Circular 71.* Results of experiments on wintering steers on Johnson grass hay alone and with varying amounts of cottonseed meal are discussed.

Grimes, J. C., Sewell, W. E., and Cottier, G. J.—**Cottonseed Meal as a Supplement to Pasture for Fattening Steers in the Black Belt of Alabama.** *Alabama Agricultural Experiment Station Circular 72.* Results of a six-year experiment on feeding cottonseed meal to steers which were fattened on pasture for the July market are reported. It was profitable to feed meal to cattle on grass during five of the six years.

Ware, L. M.—**The Black Locust in Alabama.** *Alabama Agricultural Experiment Station Circular 73.* Results of numerous experiments are given showing that the black locust is not adapted to general use in soil-erosion control programs in Alabama. Cultivation and fertilization were found necessary for satisfactory growth on old abandoned land. The rapid growth of trees planted on fair land and given cultivation and an application of fertilizer the first year indicated that the locust was well adapted to the production of fence posts on farms. Returns the first year from an intercrop of cotton was found sufficient to defray the cost of trees, setting, and cultivation.

Horticultural Staff.—**The Fall Crop of Irish Potatoes.** *Alabama Agricultural Experiment Station Leaflet 11.* Results and discussion are given on the fall crop of Irish potato. Fair to high yields were shown possible if potatoes are planted on a moist, well-drained bottom land and mulched with straw. Seed from the local-grown spring crop was as good as any other source.

The Triumph variety seemed best adapted to the fall crop. In Central and South Alabama it was not necessary to use the ethylene chlorhydrin seed treatment to obtain satisfactory sprouting of the spring crop.

Horticultural Staff.—**Care and Pruning of Ornamental Shrubs.** *Alabama Agricultural Experiment Station Leaflet No. 12.* A short discussion is given of the planting, care, and pruning of the more common shrubs and roses.

Salmon, W. D.—**Dog Feeding Suggestions.** *Alabama Agricultural Experiment Station Leaflet No. 13.* This leaflet gives the formula and the method of feeding a simple home-mixed ration for dogs.

Horticultural Staff.—**Lima Beans.** *Alabama Agricultural Experiment Station Leaflet 14.* A discussion is given of varieties, harvesting, and pests of the lima bean. Soils and fertilizer requirements are also discussed.

Scarseth, George D.—**The Mechanism of Phosphate Retention by Natural Alumino-Silicate Colloids (Clays).** *Jour. Amer. Soc. Agron. 27:596-616. 1935.* An electrodialyzed colloidal clay (*bentonite*) was made into series of 0.8 per cent suspensions wherein the concentrations of P, Na, Ca, H, and OH ions were varied systematically. At equilibrium, determinations were made for the amounts of phosphates retained, the pH values, and the conductivities of the different systems before carbonation and after equilibrium with the CO_2 of the air. Colloids enriched with Fe gave the effect of this element on the phosphate retention in comparative systems.

In the very acid systems, below pH 5.2, the phosphate remained in solution unless Fe was present, then insoluble Fe-phosphates were formed with a minimum solubility at pH 3.0. At reactions above 6.1 the phosphates remained in solution in the presence of Na ions but formed insoluble Ca-phosphates when Ca ions were present.

At pH values between 5.2 and 6.1 phosphates were retained when either Na or Ca ions were on the exchange complex. This phosphate was found to be exchangeable with silicate and hydroxyl anions; thus it must be sorbed on the surfaces of the colloid. The phosphate appears to be strongly held by the aluminum bond.

The replacement of sorbed phosphate by the silicate anion was verified by plant tests on normal soils. When the phosphate was held by Fe or Ca instead of the alumino-silicate, it was not made available to plants by the silicate anion.

The alumino-silicate colloid used had a fairly definite phosphate sorption capacity. The anion sorption capacity was one-third of the cation sorption capacity, thus information was ob-

tained on the distribution of the cation and anion valences of the colloidal alumino-silicate surfaces.

Williamson, J. T.—**Efficiency of Ammoniated Superphosphates for Cotton.** *Jour. Amer. Soc. Agron. 27, 724-728. 1935.* The average results of 185 experiments with cotton on different soil groups and with different fertilizer treatments are reported. Using the increase due to superphosphate as a basis, the relative increases due to the different sources of phosphorus in the average of all experiments were superphosphate 100, ammoniated superphosphate (2% N) 100, ammoniated superphosphate (4% N) 90, and precipitated tri-calcium phosphate 95.

AGRICULTURAL ECONOMICS

A Study of Labor Income on Farms in the Dadeville Erosion Control Area. (Ben F. Alvord and J. A. Kyser).—This study, in which the Soil Conservation Service cooperated, included 552 farm management records of both white and colored farmers of all tenure groups for the year 1933. It is in its preliminary stages and the principal purpose of the study at present is to determine the economic status of farms of the area.

Sixty-four per cent of the 552 records was for white farmers and the balance for colored. This represents approximately the division between white and colored farm families in the area although this group did not include records of half-share croppers. Thirty-five per cent of the white farmers not only owned the farms they operated, but rented some of their land to tenants or half-share croppers; another 16 per cent owned and operated their farms, but rented no land; still another 20 per cent owned some and rented additional land; and the remaining 29 per cent rented all of the land they operated. Seventy-one per cent of the colored farmers was renters and the remaining 29 per cent was in various stages of ownership.

In this area white tenants had favorable labor incomes in comparison with white owners who rented no land "in or out" and with those who owned the land they operated and rented "out" additional land on other than a cropper basis (Table 1).

TABLE 1.—Average Operator's Labor Income by Tenure Groups.

	White	Colored
Owners renting land "out" on other than cropper basis	$104	$–42
Owners using cropper labor	422	–2
Owners renting no land "in or out"	132	10
Part owners	423	–13
Tenants other than croppers	270	63
Average of all groups	$314	$ 41

These relatively favorable incomes appear to have been possible because the tenants were not handicapped with real estate investments and they handled more acres of crops than their neighbors who owned and operated farms which were often too small for efficiency. White part-owners and full owners using cropper labor had more crop acres per farm than other groups and also had largest labor incomes. Colored tenants had the largest average labor income of all colored tenure groups.

The size of farm business was strongly related to success as measured by the operator's labor income on white farms. Farmers having farms of less than 30 crop acres had labor incomes averaging about $100; those having larger farms averaging up to 60 crop acres had incomes averaging about $200; those having still larger farms up to 100 crop acres had incomes averaging somewhat less than $300; and finally the farmers having farms averaging 207 crop acres had incomes averaging $945. Colored farmers having a comparable range in size of farms had labor incomes varying from $30 for the group of smallest farms to $84 for the group of farms having 60 to 99 crop acres. The five colored farmers having 100 or more crop acres per farm had labor incomes averaging $272 less than zero.

White farmers having 20 per cent or less of their crop acreage in cotton had labor incomes averaging $176; those having 50 per cent in cotton had $339, and those having 70 per cent or more had $461. Colored farmers having similar proportions of their crop land in cotton had labor incomes averaging $-6, $42, and $72, respectively.

White farmers having cotton yields of less than 100 pounds of lint per acre had labor incomes averaging $62 and colored farmers having similar yields had $-28; white farmers having lint yields of 150 to 199 pounds had $228 and colored farmers $63; and white farmers having lint yields in excess of 250 pounds had $424 and colored farmers $92.

While the value of farm produce used in the home was not a part of the labor income nor of the available cash, nevertheless, there was a tendency among white farmers for the labor income and available cash to be directly related to this value (Table 2).

TABLE 2.—Relation of Value of Farm Produce Used in the Home to Farm Success.

Produce used in the home			Available cash		Operator's labor income	
Range	Average					
	White	Colored	White	Colored	White	Colored
Less than $100	$ 29	$ 69	$340	$ 81	$327	$ 43
$100 - 199	153	146	263	112	238	52
200 - 299	248	239	277	149	210	64
300 - 399	342	344	457	218	310	25
400 - 499	449	438	499	319	333	106
500 and more	584	584	626	391	474	–38
Average	$348	$290	$423	$194	$308	$ 43

There was also a marked relationship between available cash and the value of farm produce used in the home among colored farmers. A direct relationship between the size of farm business, size of farm family, and amount of farm produce used in the farm home may help explain the relationship of value of farm produce used in the home to labor income. The small group of white farmers using an average of $29 worth of produce in the home were chiefly residents of towns who operated large farms near by.

AGRICULTURAL ENGINEERING

Method of Aggregate Analysis of Soils. (R. E. Yoder).—A satisfactory method and apparatus for the determination of the size distribution of water-stable aggregates in soils was developed. The method consists of allowing a given weight of soil to slake through a graded nest of screens immersed in a constant volume of water. The nests of screens are mechanically raised and lowered at a constant rate for a definite time interval in order to facilitate a complete separation of the arbitrarily chosen aggregate size classes.

Replicated aggregate analyses of a group of ten Cecil soils, varying in clay content from 5 to 55 per cent, gave a closely related family of aggregate distribution curves. The members of this soil series were similar in extent of aggregation and possessed a similar aggregate stability against the disintegrating action of water. Soil samples from numerous other soil series were found to be characterized by different distributions of water-stable aggregates. The method was found to be useful in studying the physical nature of the erosion process.

Physical Nature of Erosion Losses from Cecil Clay. (R. E. Yoder).—The physical nature of sheet erosion was studied on controlled field plots of Cecil clay located on several slopes. Aggregate analyses were made on sediments removed by erosion when the soil was at low field moisture and at maximum water holding capacity under the following conditions: (1) fallow, (2) plowed, (3) planted in cotton, (4) planted in vetch, and (5) protected by different widths of vetch as a filter or strip crop.

It was definitely established that soil erosion losses from Cecil clay occur largely in the form of water-stable aggregates or structural units rather than in the form of textural units (sands, silt, and clay).

Winter cover crops were found to be effective in reducing sheet erosion losses by: (1) minimizing the dispersing action of beating rain, (2) decreasing the velocity of runoff and hence the transporting power of water, (3) decreasing the quantity of runoff, (4) decreasing the turbulence of runoff and hence lessening the abrasive action of sediment loaded water, and (5) by actual-

ly filtering out or holding the larger water-stable aggregates in place. On land in continuous cotton culture, vetch decreased annual sheet erosion losses about 50 per cent on all slopes (20 per cent was the maximum slope studied).

Tillage practices which increased the water absorbing capacity of the soil markedly reduced erosion losses from small rains and slow-falling rain. Such practices increased losses from heavy rains falling at high intensities.

Studies of Adhesion Between Soil and Metal Surfaces. (M. L. Nichols and F. A. Kummer).—A study of the relationship of adhesion between soils and metal surfaces, with particular reference to plow surfaces, was made. A group of metals extending over a wide range of chemical composition was selected. Metals having commercial possibilities were given particular attention, but many expensive alloys were included to study the principles of adhesion. The structure of the metals was determined by metallographic methods and varied by standard heat treatments. Photomicrographs were made for the purpose of retaining permanent records of structures. Soil solutions of a group of soils, varying in chemical properties, were displaced from field soils, and used in a specially designed apparatus to measure the spreading angle of the solution on the metal. This spreading angle was used as a measure of the attraction between the metal and the soil solution. The pH value, conductivity, and surface tension of the solutions were determined; an attempt was made to correlate these properties with the spreading of the solution on the metal. It is believed that the difference in potential between the different grains of the metal materially affects the spreading angle and consequently, the adhesion of the soil to the metal. Metals in which the various ingredients are held in solid solution have a low spreading angle which is apparently due to the lack of separation between the ingredients. Metals with free graphitic carbon, such as cast iron, had a greater attraction for the soil solution. This is thought to be due to the absorption of hydrogen by the graphite. It was found that impurities, when segregated, materially increased the variations in surface potential.

Development of Mathematically Perfect Plow Surfaces for Experimental Work. (M. L. Nichols and F. A. Kummer).—A method of evolving perfect plow surfaces from parametric equations of plow surfaces was developed. By the method of analysis which was previously developed, the plow surfaces, especially those of the digger-type plow, could be described by parametric polar-coordinate equations. These equations represent the movement of an arc of a circle around a point moving in the direction of travel of the plow, and passing through the tip of the wing of the share.

The general form of these equations is:

$$\Theta = ae^{bx} \qquad \Phi = a'e^{b'x}$$

Where Θ = vertical rotation of the arc,
Φ = horizontal rotation of the arc,
x = time or distance of travel,
a and a'; b and b' being constants.

The new method of evolving these surfaces consists of plotting the equations on common cartesian coordinate paper and constructing metal cams from the curves. The cams are then placed so that they correspond to their respective values at different points or distances along the line of travel of a carriage bearing the arc desired to superimpose on the plow surface. The cams rotate the arc in accordance with the formulas.

Soil Crust Formation and its Relation to Cotton Stands. (A. Carnes).—Soil crust formation was studied on semi-controlled field plots of Cecil clay and Cecil sandy loam. Cotton was planted on beds and on the level; the compaction of soil under the seed was varied from zero to twelve pounds per square inch. The moisture content of the soils was varied.

The results of this study indicate that: (1) In most cases the percentage of and rate at which plants broke through the crust were increased by compacting the soil under the seed. (2) Compactions of four and eight pounds per square inch gave better results, in most cases, than no compaction or twelve pounds per square inch. (3) In all plantings where the conditions were the same, a better stand was obtained on Cecil sandy loam than on Cecil clay. (4) There was no marked difference in the temperature of the soil at the seed (½ inch deep) on beds and on the level. (5) Under abundant moisture conditions, the compaction of the soil under the seed did not materially increase the percentage of stand of cotton.

The Effect of Various Crops on Soil Erosion Control. (E. G. Diseker).—Soil erosion studies were made during the growing season of one crop of cotton on controlled plots of Cecil clay having slopes of 0, 5, 10, 15, and 20 per cent. Unthinned cotton planted in 36-inch rows was twice as effective in preventing erosion as cotton spaced 12 inches in the drill in 36-inch rows.

Soil losses from plots during the growing season of a crop of corn and velvet beans interplanted in 4-foot rows, one plant of each spaced 18 inches in the drill, were compared to the losses on smooth fallow plots. The loss on the level plot, in corn and beans, was 255 pounds per acre, and the loss on the fallow plot was 674 pounds per acre. The loss on the 20 per cent slope, in corn and beans, was 43,228 pounds per acre, and the loss from the fallow plots was 118,197 pounds per acre. Rainfall which produced erosion during this period was 13.4 inches.

For the prevention of erosion, plots on which hairy vetch was planted in 18-inch rows were compared to smooth fallow plots.

Soil losses from the level fallow plot and from the level vetch plot were 927 and 773 pounds per acre, respectively. Losses from the fallow plot and vetch plot, each having a 20 per cent slope, were 182,662 and 19,675 pounds per acre, respectively. The erosion-producing rainfall during this period was 20 inches.

AGRONOMY AND SOILS

Method of Preparing Land for Cotton. (E. L. Mayton).—The experiment was conducted on Norfolk sandy loam soil over the ten-year period, 1925-1934. Cotton land was prepared by deep breaking and shallow breaking as compared with unbroken land. A complete fertilizer was used at a constant rate on all plots; it was applied in deep and shallow furrows and bedded on or applied in the bed with the seed at the time of planting cotton on deep-broken, shallow-broken, and unbroken plots.

The ten-year average yields of cotton show that the yield was increased an average of 105 pounds of seed cotton per acre by deep breaking as compared to the other two methods. The different methods of applying the fertilizer had no significant influence on the yields.

Ammonium Phosphates vs. Superphosphate for Cotton. (J. T. Williamson, J. W. Richardson, and J. R. Taylor, Jr.).—Complete fertilizers made of (1) mono-ammonium phosphate, ammonium sulfate, and muriate of potash, (2) di-ammonium phosphate, ammonium sulfate, and muriate of potash, and (3) superphosphate, ammonium sulfate, and muriate of potash were tested on various Alabama soils in 1932-1935, inclusive. Each mixture was used alone and with a supplement of dolomite. The di-ammonium phosphate mixture was also used with supplements of both dolomite and gypsum. In these experiments all plots were fertilized with a mixture equivalent to 600 pounds per acre of a 6-10-4 (N P K) fertilizer. Most of the experiments were conducted on soils of the Clarkesville, Decatur, Greenville, and Norfolk series. Data are available from 199 experiments conducted during the four-year period.

A study of the data by soil groups shows that on the Clarkesville, Decatur, Greenville, and Norfolk groups the superphosphate mixture produced, respectively, 69, 15, 58, and 106 pounds of seed cotton per acre more than the di-ammonium phosphate mixture, and 71, 50, 54, and 103 pounds more than the mono-ammonium phosphate mixture when each was used without a supplement. When each of these mixtures was supplemented with dolomite at the rate of 212 pounds per acre, the yield of seed cotton was materially increased over the unsupplemented mixtures except on the Greenville soils. With the dolomite supplement, all of the mixtures produced approximately the same yield of seed cotton on the Decatur and the Greenville soils;

however, on the Clarkesville and the Norfolk soils the superphosphate mixture produced approximately 50 pounds of seed cotton per acre more than either the mono-ammonium or the di-ammonium phosphate mixture. A supplement of 50 pounds of gypsum per acre added to the di-ammonium phosphate-dolomite mixture did not affect the yield except on the Norfolk soils where the gypsum increased the yield by 38 pounds of seed cotton per acre.

The avearge of all experiments shows that the di-ammonium phosphate mixture without a supplement produced 853 pounds of seed cotton per acre, when supplemented with dolomite 947 pounds, and when supplemented with both dolomite and gypsum 966 pounds. The mono-ammonium phosphate mixture produced 847 pounds of seed cotton per acre without a supplement and 963 pounds when supplemented with dolomite. The superphosphate mixture produced 925 pounds of seed cotton per acre without a supplement and 993 pounds with a supplement of dolomite.

Soybean Variety Tests. (H. B. Tisdale).—Ten variety-tests of soybeans were conducted on the experiment stations and experiment fields of Alabama in 1935. For the past three years, the following varieties have been the highest yielding varieties for both hay and seed in any section of the State: Tanloxi, Laredo, Easycook, Mathews, and Chiquita. The Easycook is also one of the varieties used for human food. The Otootan variety produces high yields of hay, but is too late in maturing for high seed production in all sections of the State. Varieties of soybeans that produce high yields of both seed and forage which are too coarse for hay are: Biloxi, Manloxi, Tokio, and Tarheel Black. These varieties are valuable for grazing and interplanting with corn.

Factors Affecting Lint Development in Cotton. (D. G. Sturkie).—In 1933 a study was begun to determine the effect that fertilizers and organic matter might have on the development of seed and lint in cotton. The treatments used and the results for 1933 are reported in the forty-fifth annual report, Page 17.

The results obtained may be briefly summarized as follows:

1. When the soil was kept moist, an application of a fertilizer containing nitrogen increased the length of lint very slightly, increased the weight per boll 15.4 per cent, decreased the percentage lint 2.8 per cent, and increased the weight per seed 11 per cent.

2. When the soil was permitted to become dry, an application of a nitrogen fertilizer decreased the length of lint 1.1 mm. but the weight per boll, weight per seed, and percentage of lint were approximately the same as for cotton that did not receive nitrogen.

3. A deficiency in soil moisture decreased the length of lint, weight per boll, weight per seed, but increased the percentage of lint. The greatest effect on these characters was produced on the plots that received a complete fertilizer or manure.

The Influence of $CaCO_3$ and $Ca.Mg(CO_3)_2$ on Soils and Plants. (J. A. Naftel).—A group of eight soils consisting of Norfolk, Hartsells, Kalmia, Decatur, and Cecil series was limed in increments over the complete saturation range to the point of excess CO_3. The sources of lime were C. P. $CaCO_3$ and $Ca.Mg(CO_3)_2$. Five successive crops were grown in the greenhouse and data were obtained on yields, and soil and plant compositions.

Growth of the first two crops—Austrian peas, and rape—was generally increased by the lime up to 50-75 per cent Ca-saturation. The yield curve passed through a maximum at 50 to 75 per cent saturation, and in some cases at higher degrees of saturation the yields were lower than for the unlimed soil. The Ca.Mg lime resulted in slightly greater yields than the Ca lime. With the three succeeding crops, sorghum, vetch, and sorghum, the maximum in the growth curve occurred at higher degrees of Ca-saturation with each crop. On the light soils the maximum yield for the last crop of sorghum occurred at 100 to 125 per cent saturation with the yields doubled as compared with the unlimed soils. The increased yields from the Ca.Mg lime became more evident with each succeeding crop.

The changes induced in the soil by liming were different for the two sources of lime. The Ca-lime increased the exchangeable Ca, pH value, and P soluble in .002 N H_2SO_4, while decreases were obtained in exchangeable Mg, Mn, and K. The Ca.Mg-lime increased both the exchangeable Ca and Mg, pH value, exchangeable K, and P soluble in .002 N H_2SO_4. It is significant that the increase in exchangeable K and .002 N H_2SO_4 extracted P were obtained from the use of Ca.Mg-lime. It should be mentioned that the pH values of the soils decreased with each crop which was probably due to the accumulation of acid residue from the fertilizers and to the removal of Ca and Mg by the plants.

Calcic lime influenced the composition of sorghum, third crop, as follows: Ca was greatly increased but this was accompanied by decreases in Mg, P, K, Mn, and Fe. Dolomitic lime increased the P and Mg content of plants as compared with Ca-lime. The data from the analyses of plants from one of the Norfolk soils are given as a typical example in Table 3.

It appeared that liming injury was associated with low exchangeable Mg, Mn, K, and available P and high Ca contents in both soils and plants.

Relationship Between Nitrite and Formaldehyde Concentration Within the Algal Cell. (Anna L. Sommer).—Evidence that formaldehyde and nitrite combine in protein synthesis was obtained by the use of the Allison magneto-optic apparatus. The

TABLE 3.—Analyses of Sorghum Grown in Greenhouse on Norfolk Sandy Loam Limed for One Year.

Soil No. 942		Percentage of oven-dry weight								Weight of crop
No.	Percentage saturated	Ash	Total N	Ca	Mg	K	Mn	P	Fe	Gms
Unlimed										
1	---	4.70	0.650	0.88	0.20	0.50	0.010	0.20	0.050	32.8
Limed with $CaCO_3$										
2	25	4.65	0.650	0.92	0.18	0.50	0.011	0.20	0.050	34.2
3	50	4.62	0.520	1.04	0.14	0.40	0.009	0.17	0.045	44.9
4	75	4.43	0.615	1.09	0.14	0.38	0.007	0.14	0.050	50.4
5	100	4.40	0.488	1.27	0.11	0.32	0.005	0.12	0.037	51.9
6	125	4.55	0.412	1.30	0.096	0.33	0.008	0.10	0.030	53.5
Limed with $Ca.Mg(CO_3)_2$										
7	50	4.52	0.485	0.70	0.49	0.55	0.014	0.18	0.045	48.4
8	75	4.70	0.510	0.60	0.62	0.30	0.008	0.15	0.045	52.9

concentration of formaldehyde increased more rapidly on exposure of algal cultures to light in the absence of nitrite from the culture solution than in its presence. The concentration of nitrite in the presence of light increased more rapidly in cultures that had been aerated with carbon dioxide-free air than in cultures containing bi-carbonates. The formation of glucose and the reaction between nitrite and formaldehyde proceeded simultaneously when both nitrite and formaldehyde were present.

The presence of phosphate in the culture medium accelerated the utilization of nitrite in the presence of small concentrations of formaldehyde and of the ammonium ion, in the presence of glucose, in the dark. The formation of glucose from formaldehyde (in very low concentrations) in the dark was also accelerated by the presence of phosphate in the medium.

ANIMAL HUSBANDRY

STUDIES OF VITAMIN B COMPLEX. I. **The Vitamin B-Sparing Action of Fats.** (W. D. Salmon and J. G. Goodman).—It was found that when the diet contained ample vitamin B, fats did not rank in the same order of nutritive efficiency as when the diet was free from vitamin B. Diets containing 60 per cent of cocoanut fat, olive oil, or lard produced about the same amount of gain in an 8-week period as a diet which contained no added fat except small daily supplements of cod liver oil and linseed oil. Diets containing 60 per cent of beef tallow, Wesson oil, or butter fat produced somewhat smaller gains. Diets containing 60 per cent of caproin, laurin, or a mixture of heptylin and nonylin produced markedly lower gains than any of the above natural fats.

Differences in the absorption of the various fats and fatty acid glycerides were too small to explain the differences in the vitamin B-sparing effect of these substances, with the exception of the palmitic and stearic esters. The absorption of the glycerides from myristin and lower members of the series was 95 per cent or more but the absorption of stearic glyceride was less than 20 per cent, from diets containing 23 per cent of the fatty acid as the glyceryl ester.

Studies with the Allison apparatus showed that the caprylic and caproic acid contents of the brains and livers from vitamin B-deficient animals were lower than of those from normal animals. The most marked reduction, however, seemed to be in the formic acid content of these tissues. The data apparently indicate the transformation of carbohydrate through formaldehyde to formic acid and may indicate that vitamin B functions in connection with this transformation.

II. **A Comparison of the Chick and the Rat as Experimental Animals for Assays of Vitamins B, G, and "B_4".** (W. D. Salmon and G. A. Schrader).—Comparative tests of the Wisconsin diets 242A, 231H, and 441A were made on chicks and rats. Chicks developed symptoms of vitamin B-deficiency in an average of 16 days on diet 242A; rats made an average gain of 147 grams per rat in 6 weeks and failed to show any symptoms of vitamin B-deficiency.

Chicks fed diet 231H developed severe symptoms of vitamin G-deficiency, the onset of symptoms beginning about the fifteenth day. Rats gained an average of 122 grams in 6 weeks and showed no pellagra-like symptoms after 16 weeks on the heated diet. Even heating the diet for 168 hours at 120° C. failed to produce any pellagra-like symptoms, although growth was greatly retarded, averaging only 48 grams in 10 weeks.

Diet 441A produced an average gain of 137 grams per chick in 6 weeks and an average gain of 173 grams per rat in the same time. Neither chicks nor rats showed any symptoms of paralysis.

It is apparent that the rat is much more refractory than the chick in vitamin B and G experiments. As a result the Wisconsin basal diets are entirely unsatisfactory for use with rats and the diet 441A is not dependable for use with either chicks or rats.

The Use of the Polarizing Microscope for the Study of Myelin Degeneration in Peripheral Nerves. (C. O. Prickett).—The study thus far has been confined to the following phases: (1) The study of normal nerves to determine the extent of normal variation, (2) the study of nerves which have been sectioned and left for varying periods of time to determine the progress of degenerative processes, and (3) a comparison of normal and sectioned nerves studied by the polarizing and Marchi methods.

Work done to date indicates that the polarizing method is more dependable than previous methods designed to show changes in peripheral nerves due to degenerative processes.

The Use of Ice in Curing Meat on the Farm. (J. C. Grimes and W. E. Sewell).—Studies were made which are thought to be of fundamental importance in meat curing. They are: (1) the rate of salt penetration into hams which are being cured in a brine solution with a salometer reading of 75° and (2) the length of time pork being cured in brine must be held at a low temperature for a proper cure.

In the first study, 21 hams were placed in tubs of brine at a temperature of 33° F. Three of the hams were removed from the brine at the end of each weekly period for seven consecutive weeks. Samples were taken through the hams, both crosswise and lengthwise, as shown in Figure I, and analyzed by Mohr's method for sodium chloride content. The results are summarized in Table 4 and show that:

(1) The rate of accumulation of salt in the surface of hams was rapid during the early part of the curing period but became slower as the length of time in brine increased.

(2) The rate of salt penetration in hams was slower from the skin side than from the flesh side.

(3) The rate of salt penetration to the center section of hams was slow, there being only about four per cent of salt in the center area of the hams at the end of seven weeks.

(4) Salt penetration into hams was more rapid parallel with the muscle layers than crosswise.

In the second study, for each test, six tubs of 75° brine were prepared and chilled to a constant temperature of 33° F. in a cooler. The test period began on June 6 and continued for 6 consecutive weeks. Three hogs were killed, divided into major cuts while still warm and a ham, shoulder and side weighted down in each tub. The atmosphere in the cooler was held at 33° F. throughout the test. At the end of each weekly period one tub was removed from the cooler and set in a room with a temperature of about 85° F. where it remained during the remainder of the period. At the end of 6 weeks when all tubs had been removed from the cooler all the meat was taken out of the brine, smoked and hung in storage in the smoke house. The test was repeated. The average green weights of the hams, shoulders and bacons used in the two tests were 17.49 pounds, 15.85 pounds, and 8.58 pounds, respectively.

After the meat from the two tests had hung in storage for approximately two months it was taken down, weighed, cut, samples cooked and rated for odor and flavor by a number of students and faculty members.

TABLE 4.—Effect of Length of Time in Brine on Salt Penetration Into Hams.

Sample No.	Location of sample	Direction of core	Percentage NaCl at weekly intervals (dry weight basis)						
			1 week in brine	2 weeks in brine	3 weeks in brine	4 weeks in brine	5 weeks in brine	6 weeks in brine	7 weeks in brine
1	Flesh surface	Crosswise	9.58	13.84	18.81	17.62	23.29	27.25	27.97
2	Across center	Crosswise	.11	.40	1.22	1.58	2.20	4.05	4.15
3	Skin surface	Crosswise	3.42	3.14	5.05	5.31	5.79	7.00	9.21
4	Shank surface	Lengthwise	18.02	23.16	25.64	25.96	30.77	32.08	36.02
5	Midway between shank and center	Lengthwise	.18	1.68	2.21	1.44	3.86	5.31	7.10
6	Center	Lengthwise	.11	.18	.92	.52	.38	.85	.80
7	Midway between center and butt	Lengthwise	.14	.44	1.47	2.10	3.77	8.21	7.45
8	Butt surface	Lengthwise	14.37	17.31	24.14	22.23	26.31	34.24	31.30

The results of the two tests show that:

(1) In each test definite spoilage occured in the tubs held at a low temperature for only one week.

(2) All meat held at a low temperature for two weeks or more was rated as desirable food.

(3) Meat held at a low temperature for a relatively long period of time was rated highest, on the average, in desirable odor and flavor.

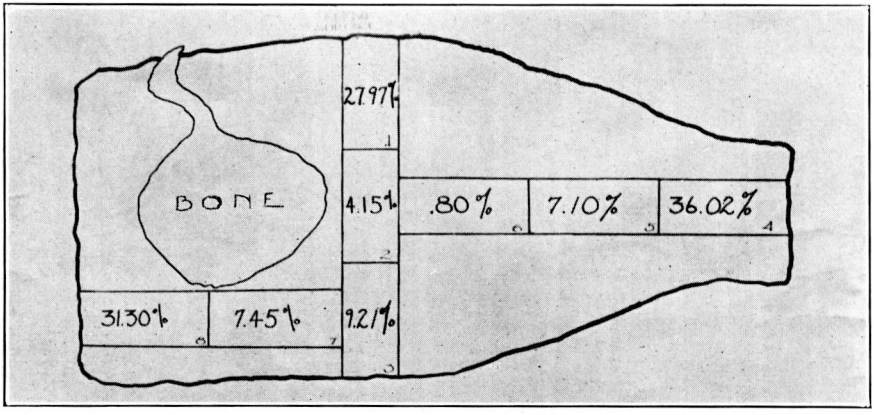


FIGURE 1.—Concentration of salt (dry weight basis) in various portions of a ham which was in brine 49 days.

Kudzu as a Grazing Crop. (J. C. Grimes).—Four acres of kudzu were divided into five plots and grazed by beef cows as follows during the summers of 1934 and 1935.

Plots 1 and 2, one-half acre each, grazed alternately with one cow.

Plot 3, one-half acre, grazed with one cow.

Plot 4, one acre, grazed with one cow.

Plot 5, one and one-half acres, grazed with two cows in 1934 and one cow in 1935.

All cows were in medium flesh when turned on kudzu. They received no supplementary feed during the test. It was noticed that the cows preferred to graze more in the low places where the kudzu leaves were rank and dark green than on the high places where the leaves were pale green. There was also a tendency for the animals to graze the plants more closely near the shade.

A summary of the results for the two summers is given in Table 5.

TABLE 5.—Summary of Results in Grazing Kudzu With Beef Cows During the Summers of 1934 and 1935.

Plot No.	Size of plot	Year	Dates grazed	Cow days grazing	Pounds - per cow		
					Initial weight	Final weight	Gain
1 & 2	½ acre each	1934	6/26-8/27	42	930	960	30
		1935	6/ 3-8/ 3	56	1,150	1,260	110
	Average			49	1,040	1,110	70
3	½ acre	1934	6/26-7/24	28	920	930	10
	Average	1935	6/ 3-7/ 3	28	845	885	40
				28	882	907	25
4	1 acre	1934	6/26-9/11	77	700	825	125
	Average	1935	6/ 3-8/ 3	56	1,040	1,105	65
				66.5	870	965	95
5	1½	1934	6/26-8/21	112	1,650*	1,815*	82
	acres	1935	6/26-8/21	56	1,060	1,170	110
	Average			84	903	995	92

*Two cows were used on this plot in 1934.

Value of Kudzu and Other Forms of Summer Green Feed for Poultry. (G. J. Cottier and D. F. King).—The object of this experiment was to compare kudzu with cowpeas and soybeans as a summer green feed for poultry. In this experiment the green feeds were compared when hand fed to confined birds and when the birds were allowed to graze these crops. The ration other than green feed was the same in all lots. Kudzu was ready to be used as a source of green feed earlier in the spring than cowpeas or soybeans and produced more pounds of green feed per acre than the other two crops studied. It was also affected less by drouth than cowpeas or soybeans. Although kudzu was not quite as palatable as soybeans, it was found to be a satisfactory, inexpensive summer green feed for poultry.

BOTANY AND PLANT PATHOLOGY

Wild Onion Control Studies. (E. V. Smith).—Three years results indicate that the germination of the bulbs of wild onion, Allium vineale L., which begins sometime in the summer proceeds so rapidly that a large percentage of them is active (conversely, a small percentage is dormant) in January. New bulbs are recognizable within the tissues of the mother bulbs in late December but few of them are found external to the mother bulb before February. Consequently, there is a period of one to two months in mid-winter when there are few dormant bulbs, and spraying during this period with a 10-90 mixture of creosote-kerosene appears to offer a satisfactory method of eradicating the pest from Bermuda grass lawns and pastures.

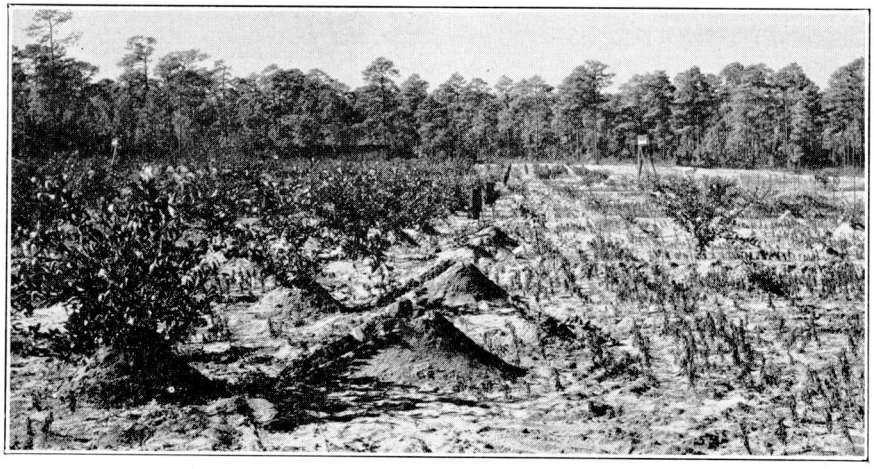
Studies of Nut Grass. (G. L. Fick, E. V. Smith, and E. L. Mayton).—The longevity of nut grass tubers was studied in a greenhouse experiment. No tubers older than twenty-two months germinated; the sprouts produced by the twenty-two-month-old tubers were very weak, indicating that the vitality of these tubers had been greatly lowered.

An experiment to determine the effect of various tillage treatments on nut grass was begun on June 9, 1934. Plowing or discing land infested with nut grass at intervals of one week, two weeks, or whenever sprouts appeared (interval varied from 14 to 28 days) throughout the 1934 growing season reduced the tuber infestation about 75 per cent, whereas plowing or discing at intervals of four weeks did not reduce the infestation (determined by making tuber counts). Plowing or discing at intervals of one week or two weeks or discing whenever sprouts appeared throughout two growing seasons (1934 and 1935) eradicated the nut grass, as indicated by the tuber counts made. Plowing or discing every four weeks or whenever sprouts appeared markedly decreased the tuber infestation but did not eradicate the weed.

ENTOMOLOGY

The Control of Citrus Insects with Oil Emulsions. (L. L. English).—Field results were obtained from an experiment containing 25 spray programs designed to control sour scab (*Sphaceloma fawcetti* Jenkins), purple scale (*Lepidosaphes beckii* Newm.), rust mite (*Phyllocoptes oleivoris* Ash.), and red spider (*Paratetranychus* spp.). Bordeaux, Bordeaux-oil, and Bordeaux-sulphur were equally effective against sour scab. Spray programs containing two summer applications of oil were more effective against purple scale and red spider than those containing one application. These programs did not control rust mite when sulphur was omitted. Selocide as a supplement to oil sprays, increased their efficiency for rust mite. Programs containing frequent applications of lime sulphur, wettable sulphur, and sulphur dust gave almost perfect control of rust mite, but poor control of red spider. Six applications of 1.5 per cent lime sulphur was more effective against purple scale than an equal number of liberal dustings.

The Effectiveness of Powdered Derris Root with Various Carriers Against Citrus White Fly, (*Dialeurodes citri* Ash). (L. L. English).—In experiments with powdered derris added to soaps, sulfated alcohols, sulfonated castor oil, sodium salts of alkylated aryl compounds, oil emulsions and other materials, the dilute oil emulsions (0.5 and 1.0 per cent) formed more effective combinations with derris than the more specific wetting agents. The effectiveness of derris was depressed in both acid and alkaline wetting media. Liquid lime sulphur, likewise, depressed the ef-



HEATED UNHEATED

FIGURE 2.—Results of Orchard Heating in experimental Satsuma grove at Spring Hill during the winter of 1934-35.

fectiveness. With soap, derris was more effective than nicotine sulfate and organic thiocyanate sprays.

Heating for the Protection of Satsuma Orange Trees. (L. L. English).—The technique for burning a charge of petroleum coke on a mound of earth was developed and recommended. As a result of operating heaters during three cold waves in 1934-35, the experimental grove at Spring Hill was saved from serious damage. In the most severe cold wave a film of ice covered the foliage; the temperature reached a minimum of 19° F. and was under 25° F. for 24 hours. The tree loss in the heated area was 2.4 per cent; in the unheated check it was 37.0 per cent. (See Fig. 2).

Physiology of Insects with Reference to Their Control. (H. S. Swingle).—The relative speed of toxic action of acid lead arsenate, calcium arsenate, and magnesium arsenate was determined for a number of insects having digestive tracts with acidities ranging from pH = 6.0 to pH = 9.6. Toxicity was shown to be correlated with the amount of soluble arsenic released from these arsenicals in phosphate solutions having the same pH as the digestive tract of the insect. When the hydrogen-ion concentration of the digestive tract of the insect was known, the relative toxicities of these arsenicals to that insect could be predicted.

Pecan Weevil (*Curculio caryae*). (H. S. Swingle).—Records of the number of weevils upon the trees and the number of wormy

nuts at harvest on jarred and unjarred trees have shown that jarring is an economical method of control for the pecan weevil. Good results have been secured by jarring once a week for three weeks, beginning August 15. Somewhat better results were secured when jarring was continued one week longer.

Boll Weevil Control with Calcium Arsenate. (J. M. Robinson and F. S. Arant).—Boll weevil infestation on the plots studied was 10 per cent by July 12. Three applications of dust during the season protected the cotton from boll weevil damage. During seven of the past twelve years boll weevil infestation was great enough to necessitate protection by dusting the cotton with calcium arsenate. The seed cotton yield in 1935 brought the seven-year average increase from dusting on the three unfertilized plots to 60, 59, and 40 pounds of seed cotton per acre, respectively. The seven-year average increases from dusting where the plots were treated with 500, 1000, 1500, and 2000 pounds of 4.8-9.6-4.8 fertilizer per acre were 237, 302, 287, and 362 pounds of seed cotton per acre, respectively.

HORTICULTURE AND FORESTRY

Response of Early Truck Crops to Soil Improvement Methods Involving Summer Legumes. (L. M. Ware).—Experiments which have been in progress for five years with summer legumes in soil improvement studies have shown increases in yield of truck crops following legumes far below what might have been expected from the quantity of nitrogen added by the legume. The experiments have shown a progressive increase each year in the yield of truck crops from the legume and a considerably larger crop yield from commercial nitrogen on legume plots than on non-legume plots. Six truck crops have been included in the study and comparisons have been made of treatments receiving no commercial nitrogen and no legume, no commercial nitrogen but a legume, one-half standard application of commercial nitrogen and a legume, standard application of commercial nitrogen and a legume, and standard application of commercial nitrogen without a legume. The legume (crotalaria) followed the spring truck crop each year and was disced into the soil during the winter preceding the next truck crop.

In 1933 two and one-quarter tons of crotalaria from the previous year's crop supplying, theoretically, about 27 pounds of nitrogen increased the yield of beans only 5 hampers per acre; 24 pounds of commercial nitrogen increased the yield of beans 67 hampers per acre.

In 1934, 9 tons of crotalaria from the previous year's legume crop supplying, theoretically, about 108 pounds of nitrogen increased the yield of beans only 66 hampers per acre; 48 pounds of nitrogen from commercial sources increased the yield of beans

145 hampers. An application of 48 pounds of commercial nitrogen increased the yield of beans 41 hampers more than 5 tons of crotalaria supplying approximately 60 pounds of nitrogen and 24 pounds of nitrogen from commercial sources.

In 1935, 13 tons of green crotalaria, supplying approximately 156 pounds of nitrogen, gave an increase in yield of 103 hampers of beans which was short by 26 bushels of the increase obtained by 48 pounds of commercial nitrogen. By the fifth year (1935) the yield of beans on legume plots receiving in addition 48 pounds of commercial nitrogen—an amount experimentally shown to be sufficient under normal conditions for maximum yields of beans—was 49 bushels per acre more than the yield on non-legume plots receiving the same amount of commercial nitrogen. Similarly, a standard application of 90 pounds of commercial nitrogen per acre, known to be sufficient for maximum production of potatoes, gave 72 bushels of potatoes per acre more on the legume plots than on plots receiving no legume.

Data on cabbage, corn, and potatoes present in general a picture remarkably similar to that of the bean. With all crops, the nitrogen supplied from a summer legume grown the previous year was strikingly less effective in increasing yield than much smaller applications of commercial nitrogen. Each succeeding year there was a progressive increase in yield from legumes, resulting after 4 and 5 years in a material increase in yield from legumes alone and the development of a condition resulting in much larger yields from the application of a given amount of nitrogen on legume plots than on non-legume plots.

It has not yet been determined whether the nitrogen of legumes has been largely lost from the soil before the truck crops require it or whether nitrification is delayed too late for benefit to the crop. Determinations of nitrates in legume plots during February, March, and April have shown definitely that there is a very small amount of nitrates in the soil at the time early truck crops need them most.

Influence of Different Fertilizer Materials on the Earliness and Yield of Snap Beans. (L. M. Ware).—Studies on Norfolk soil at Fairhope, on Ruston soil at Thorsby, and on Norfolk, Eutaw and Cecil soils at Auburn have shown that phosphorus, nitrogen, and potash each affects snap beans very differently as regards earliness and yield of crop. The general response has been the same for a given fertilizer element on each of the various soils.

Increased applications of phosphorus have greatly increased the total yield of beans, the yield of the early crop and the percentage of the total yield as early beans. Thus at Fairhope as applications of superphosphate were progressively increased from 0 to 240 to 480 pounds per acre the total yield of beans increased from 8 to 92 to 164 hampers per acre, the yield of early

beans from 2 to 37 to 78 hampers, and the percentage of early beans from 23 to 40 to 47 per cent of the total yield, respectively.

Increased applications of nitrogen have increased the total yield of beans almost as much as phosphorus, but the percentage of the total crop as early beans has been reduced for each increase in nitrogen applied; the yield of early beans, however, has been decidedly larger for each increase in application. At Auburn on Norfolk soil, as applications of nitrogen were progressively increased from 0 to 30 to 60 to 90 to 120 pounds of nitrogen per acre, the total yield of beans increased from 99 to 196 to 299 to 349 to 382 hampers per acre, and the yield of early beans from 44 to 60 to 93 to 105 to 108 hampers, respectively; at the same time the percentage of early beans progressively dropped from 44 to 31 to 31 to 30 to 28 per cent of the total.

Increased rates of potash on some soils slightly increased yields; on others, increased rates had no effect on yields. Where increased potash applications increased yields, the percentage of the crop as early beans was decidedly lowered. At Fairhope as applications of potash were progressively increased from 0 to 24 to 48 to 72 pounds per acre the percentage of the total crop as early beans was reduced from 66 to 50 to 48 to 43 per cent, respectively. The corresponding total yields fluctuated from 116 to 151 to 161 to 149 bushels per acre.

Fertilizers for Irish Potatoes. (L. M. Ware and R. W. Taylor).—Experiments have been conducted for several years at numerous points in the State to determine the fertilizer requirements of the Irish potato. The yields obtained from fertilizers of different analyses at the several places are given in Table 6. A

TABLE 6.—Yield, in Bushels Per Acre, of Irish Potatoes at Different Points in Alabama from Use of Fertilizer of Different Analyses.

Fertilizer 1,500 lbs. per acre	Substations			Experiment fields	
	Sand Mountain	Tennessee Valley	Gulf Coast	Brewton	Thorsby
N - P_2O_5 - K_2O	5 yr. ave.	4 yr. ave.	5 yr. ave.	3 yr. ave.	3 yr. ave.
6 - 10 - 6	133	119	174	216	---
6 - 10 - 0	97	111	98	171	113
6 - 10 - 3	127	119	156	203	124
6 - 10 - 6	115	128	186	221	130
6 - 10 - 9	134	134	182	222	133
0 - 10 - 6	48	71	84	50	36
2*- 10 - 6	103	113	156	153	106
4 - 10 - 6	124	133	174	216	134
6 - 10 - 6	148	136	180	211	127
6 - 0 - 6	70	88	21	64	59
6 - 5 - 6	123	118	151	186	122
6 - 10 - 6	131	131	179	215	139
6 - 15 - 6	132	133	189	216	137

*At the Thorsby Field and at the Gulf Coast Substation the nitrogen increments were 0 - 3 - 6 - 9 per cent corresponding to 0 - 2 - 4 - 6 per cent, respectively, at the other places.

base application of 1500 pounds per acre was applied at each place. It will be noted that 6 per cent or 90 pounds of potash per acre was adequate at each place, although very small increases in yield were obtained from the two North Alabama Substations from larger applications of potash. At the Tennessee Valley Substation and at the Brewton field 4 per cent or 60 pounds of nitrogen per acre was adequate for most economic yields, but 6 per cent or 90 pounds of nitrogen per acre produced economical gain over the 4 per cent nitrogen at the Sand Mountain and Gulf Coast Substations and on the Thorsby field. At all points 10 per cent or 150 pounds of phosphoric acid was adequate for most economical yields.

Use of Fertilizers on Black Locust Planted for Soil Erosion Purposes. (D. J. Weddell).—Millions of black locust seedlings are being produced in the South for use in soil erosion control programs. Experiments previously reported by the Alabama Station have shown that the black locust in this State will fail when planted on eroded hillsides, along eroded gullies, or on grass land unless special care has been given in preparing the land and tending the plants for one year. It has been found that preparation of land, cultivation of plants, and fertilization of plants each progressively applied gives a very marked increase in plant growth. Since land preparation and tillage operations increase erosion, it is desirable to know if fertilization will sufficiently stimulate growth to enable the locust to establish itself and make satisfactory growth without land preparation and tillage.

In the spring of 1935 a planting was made to determine the effect of a single application of a complete fertilizer on the growth of locust planted by different simple methods. The planting was made on a badly eroded Cecil clay hillside.

Three methods of planting were used: (1) dibble planting, in which the seedlings were planted in slit-like holes in the ground; (2) shovel planting, in which the seedlings were planted in holes dug with a shovel, the hole being over one foot in diameter and deeper than needed for the roots; (3) shovel planting, in which the trees were planted in holes similar to (2), and each tree fertilized with ½ pound of a 4-8-4 fertilizer.

Measurements were taken in December, 1935. Plants set by the dibble method but not fertilized averaged 31.3 inches in height and had an average diameter at the ground of .47 inch; those set in a prepared hole but not fertilized averaged 37.3 inches in height and had an average diameter of .51 inch; those set in prepared holes and fertilized averaged 63.4 inches in height and had an average diameter of .94 inch.

If locust are to be planted on sites where the soil should not be disturbed, it appears that commercial fertilizers may be used to give locust plants the growth needed to establish themselves.

SPECIAL INVESTIGATIONS

Depth of Planting Crotalaria Seed. (J. F. Duggar).—Under conditions favorable for germination, untreated seed of an early strain of Crotalaria spectabilis came up by the end of the season to the extent of 60 per cent from a depth of 2 inches, 32 per cent from 4 inches, and only 0.33 per cent when planted 6 inches deep.

The Distance to Which Crotalaria Seeds are Thrown by Pods. (J. F. Duggar).—Numbers of crotalaria seeds thrown when the pods burst were determined in triplicate as found on successive foot-wide bands of soil beginning at the row of seeding plants. The percentages of shed seed found in these bands were 28 in the first foot, 26 in the second, 17 in the third, 7 in the fourth, 6 in the fifth, 5 in the sixth, 4 in the seventh, and thereafter about one per cent in each of the foot-wide bands to a distance of 14 feet.

Time of Planting Lespedeza Sericea. (J. F. Duggar).—From 30 pounds of scarified seed sown broadcast, good to extremely thick stands were obtained in June of the next year from sowings made in every month from April to the middle of August; those from midsummer plantings were thickest. Yields of hay harvested late in June and early in October decreased sharply from the early-sown to the late-sown plots.

In a series of plots sown at the same rate from April to November, 1935, the stands were thickest from the seedings made either in April or in midsummer.

Effects of Varied Soil Moisture on Numbers of Root Nodules. (J. F. Duggar).—Austrian winter pea and hairy, Hungarian, and woolly-pod vetches were grown from early November to early March on each of (1) a series of plots receiving rainfall, and (2) on a series from which all rainfall was excluded by the use of canvas covers, thus practically halving the percentage of soil moisture. The four species, each having 4 residual-fertilizer treatments, averaged on the dry and wet plots, respectively: for seedlings 1 month old, 3.8 and 8.1 nodules per plant; 2 months old, 6 and 17.9; 3 months old, 8.7 and 23.2; and for 4 months old, 15.6 and 49.8 nodules per plant.

Yields of green tops fluctuated in general with the number of nodules per plant.