TEXAS AGRICULTURAL EXPERIMENT STATION

AGRICULTURAL AND MECHANICAL COLLEGE OF TEXAS

W. B. BIZZELL, President

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DIVISION OF CHEMISTRY

THE SOILS OF BRAZOS, CAMP, ELLIS, AND WASHINGTON COUNTIES

B. YOUNGBLOOD, DIRECTOR

COLLEGE STATION, BRAZOS COUNTY, TEXAS

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*In cooperation with School of Veterinary Medicine, A. and M. College of Texas.
**In cooperation with United States Department of Agriculture.
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CONTENTS

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THE SOILS OF BRAZOS, CAMP, ELLIS, AND WASHINGTON COUNTIES

By G. S. FRAPS

This Bulletin deals with the chemical composition and fertility of samples of typical soils from four counties of Texas, and is the ninth bulletin of a series dealing with the chemical composition of typical Texas soils. The preceding bulletins are Numbers 99, 125, 161, 173, 192, 213, 244, and 301. Most of the samples analyzed were collected by field agents of the Bureau of Soils of the United States Department of Agriculture, in cooperation with the Texas Experiment Station.

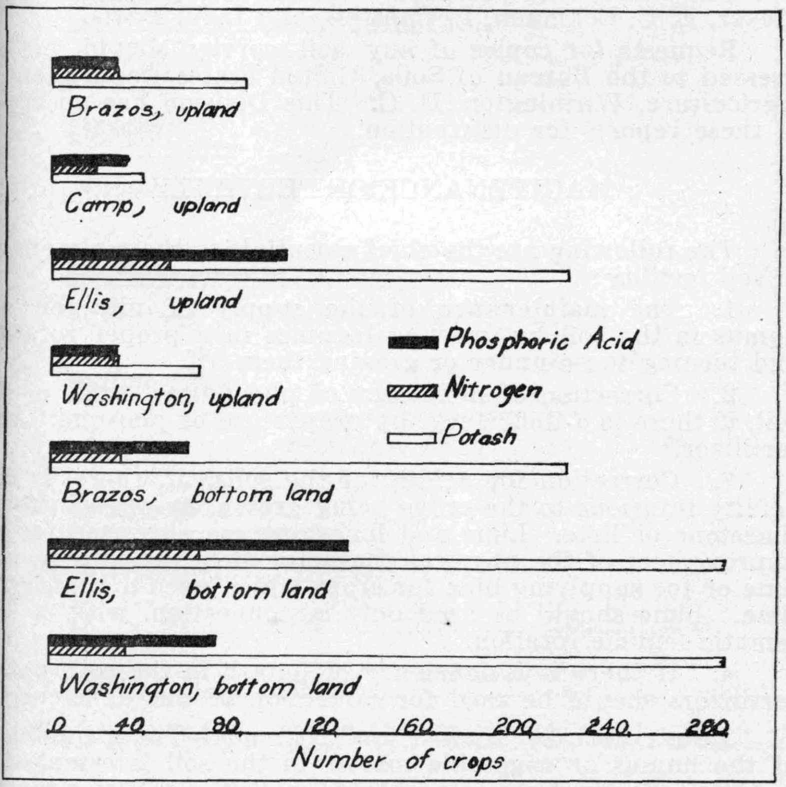

Figure 1—Number of crops of 40 bushels of corn each that could be produced by all e plant food in the average soil to a depth of 7 inches.

Detailed reports of the surveys, with maps showing the location of the various types, have been published by the Bureau of Soils, United States Department of Agriculture, and from these reports the descriptions given in this Bulletin are taken:

Soil survey of Brazos County, Texas, by J. O. Veatch and C. S. Waldrop.

Soil survey of Camp County, Texas, by W. J. Geib, E. B. Watson, Thomas D. Rice, and Clarence Lounsbury.

Soil survey of Ellis County, Texas, by Frank Bennett, R. T. Avon Burke, and Clarence Lounsbury.

Soil survey of Washington County, Texas, by A. H. Meyer, E. C. Eckmann, L. Cantrell, and L. V. Davis.

Requests for copies of any soil survey should be addressed to the Bureau of Soils, United States Department of Agriculture, Washington, D. C. This Division has no copies of these reports for distribution.

MAINTENANCE OF FERTILITY

The following are the chief essentials to the maintenance of soil fertility:

1. The maintenance of the supply of nitrogen and humus in the soil by growing legumes in a proper rotation, and turning these under or grazing them off.

2. Correction of deficiency of phosphoric acid in the soil, if there is a deficiency, by proper use of phosphate as a fertilizer.

3. Correction for acidity of the soils, if there is any acidity injurious to the crops being grown, by use of ground limestone or lime. Lime and limestone are also used for the improvement of the physical character of heavy soils poor in lime or for supplying lime for crops which need a quantity of lime. Lime should be used only in connection with a systematic legume rotation.

4. If there is a deficiency of potash in the soil, potash fertilizers should be used for correction of this deficiency.

Maintenance of Humus and Nitrogen—The maintenance of the humus or vegetable matter in the soil is essential to fertility. Partly decayed vegetable matter, sometimes termed humus, in sufficient quantity, improves the capacity of the soil to hold a favorable amount of water, enables it to break up into a good condition of tilth under the action of cultivating implements, and acts in other favorable ways. It also contains most of the nitrogen of the soil.

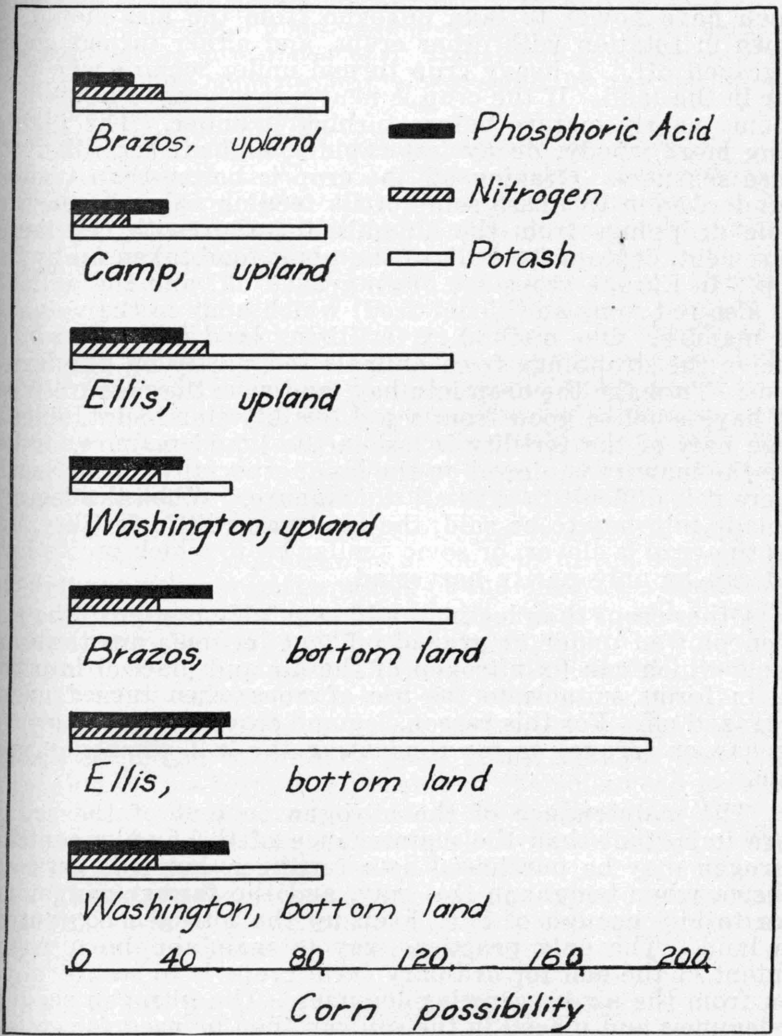

Figure 2—Corn possibility in bushels per acre of the active phosphoric acid, total nitrogen, and active potash in average soils of Brazos, Camp, Ellis, and Washington Counties.

Some soils produce well for a long time without additions of vegetable matter, but for permanent fertility, vegetable matter must be added sooner or later. Vegetable matter may be supplied in barnyard manure, which is excellent when sufficient quantities can be secured, but barnyard manure is not usually at hand in large enough quantities. Legume crops, which have power to take nitrogen from the air, should be grown in rotation with other crops, and either turned under or grazed off. A heavy crop turned under when green may sour in the land. If the crop is heavy, it is best to allow it to become nearly mature before turning it under. The plants, being more woody, decay less rapidly, and are less likely to cause sourness. Grazing off the crop is better than turning it under, as in this case some of its feeding value is secured, while droppings from the animals, together with the liquid excrement, contain the bulk of the plant food taken up by the crop. In Europe crops are often grazed off, and the animals are also fed some additional feed, which adds to the value of the manure. One method of fertilizing land is to allow it to receive the droppings from animals fed partly on purchased feeds. To make the crop into hay, and save the manure from the hay, is not so good from a soil fertility standpoint, since a large part of the fertility is lost in the liquid manure, or before the manure is placed on the land, especially in the South, where it is difficult to save all the manure. When the legume is made into hay to be sold, the land gains little fertility, unless the crop is clover, or some similar crop, which grows low, and can be only partly harvested.

Other crops than legumes add vegetable matter to the soil when plowed under or grazed off, but legumes are the only plants which can fix nitrogen of the air and place it into the soil in forms suitable to the use of crops when turned under or grazed off. For this reason, legume crops should be grown for hay or forage, or for renovating the soil whenever possible.

The maintenance of the nitrogen content of the soil is more important than the maintenance of the humus content. Nitrogen may be purchased as a fertilizer, but it is very expensive when bought in this way, and the farmer cannot afford to buy enough of it to keep up the nitrogen content of his land. The only practical way to maintain the nitrogen content of the soil for ordinary farm crops is to secure nitrogen from the air by growing legumes. The nitrogen secured by legumes and placed in the soil can then be used for cotton, corn, kafir, or similar crops, and will increase the size of the crop. Crimson clover, velvet beans, alfalfa, vetches, and cow peas are some of the possible legumes. The kind of legume best grown depends upon the climate and other conditions which make possible the largest and most easily grown legume crops, and varies with different sections of the State and different conditions of farming.

Phosphoric acid—Texas soils are frequently deficient in phosphoric acid. This Bulletin contains statements of the probable deficiencies in phosphoric acid of the soils of the counties described. A discussion of the use of phosphatic fertilizers is given in Bulletin 167. Deficiency of phosphoric acid may be readily and profitably corrected by the use of acid phosphate as a fertilizer.

Acidity—Some soils contain organic or inorganic acids. Some crops such as clover, alfalfa, barley, and rye do not grow well on acid soils. There are other crops such as cowpeas, and watermelons, which do well on acid soils. Acidity may be corrected by the use of hydrated lime, ground oyster shells, air-slaked lime, or ground limestone rock. Limestone screenings can be secured for about two dollars a ton in carload lots, and is the cheapest form of lime. An acidity of 100 parts per million requires about 500 pounds of ground limestone to the acre to correct it. Lime should be used only in connection with a proper legume rotation, for otherwise it may run down the soil rapidly. There is an old saying that "Lime makes the father rich and the son poor," and this is true for lime not used in connection with legume rotation.

The use of lime is discussed fully in Bulletin 243. The acidity of the various samples of the soils of the counties here described is shown in the tables of the analysis. Some of the soils of Brazos county are acid. No surface soil of Camp county was acid. The soils of Ellis county are not acid, but, on the other hand, are generally well supplied with lime. The soils of Washington county are not acid.

Potash—The soils of Texas as a rule contain an abundance of potash to produce good crops, though there is a variation in this respect, and some of the soils need potash as a fertilizer. In general, potash is least often needed of any fertilizer, and is often needlessly used in the South. Plants can take up more potash than they need.

The needs for potash of the various types of soils studied are indicated by the tables of analyses and interpretation of results, as well as by the pot experiments.

HOW TO USE THE ANALYSES

Analyses of the soils are given in connection with the description of the various types of soil. The interpretation of the analyses is also given and will be discussed there also.

If a soil is well supplied with plant food, but does not give good yields, its physical condition may be poor in respect to cultivation and drainage, or otherwise, or it may sometimes contain injurious substances, such as alkali. Plant disease may also be present.

If the soil is well supplied with total plant food, but low in active plant food, attempts should be made to increase the activity of soil agencies which make the plant food available, by means of additions of manure, of green crops plowed under, or, if the soil needs lime, by additions of lime or ground limestone in connection with a legume rotation.

If the crop yields are low and the plant food is deficient, fertilizer should be used.

EXPLANATION OF TERMS

Total phosphoric acid is the entire quanity of phosphoric acid contained in the soil. It cannot all be taken up by plants at once, as only a small portion is available for their use.

Active phosphoric acid is the phosphoric acid soluble in N-5 nitric acid. As shown in Bulletins 126 and 276, there is a relation between the active phosphoric acid of the soil and the amount of phosphoric acid which crops are able to take from the soil in pot experiments. There is a closer relation between the active phosphoric acid of the soil and the needs of the soil for phosphoric acid as a fertilizer, than between the total phosphoric acid and the needs of the soil, as shown in Bulletins 126 and 267.

Total potash represents the entire amount of potash in the soil. Some of this is locked up in highly insoluble silicates, and may not become available for the use of plants in a thousand years. The total potash does not show what portion of this potash may be taken up.

Acid-soluble potash is the amount of potash which is dissolved by strong hydrochloric acid, according to the former A. O. A. C. method. As pointed out by Hilgard, there is a relation between the acid-soluble potash of the soil and the wearing qualities of the soil. (Fraps' Principles of Agricultural Chemistry, page 171).

Active potash is the potash soluble in N-5 nitric acid. It represents potash which can be readily taken up by plants, as shown by pot experiments in Bulletin 145, and also in Fraps' Principles of Agricultural Chemistry, page 191.

Total nitrogen represents the entire quantity of nitrogen present in the soil. As shown in Bulletin 151 of this station, there is usually a relation between the total nitrogen of the soil, and the nitrogen which can be taken from it by crops, in pot experiments. The total nitrogen is therefore an index to the needs of the soil for nitrogen; although with worn soils the nitrogen is not as available as in new soils.

Acid-soluble lime is the lime which is dissolved by strong hydrochloric acid, as in the former A. O. A. C. method. According to Hilgard, the amount of lime found by this method is a valuable indication as to the fertility of the soil. (Fraps' Principles of Agricultural Chemistry, page 175).

Basicity—This term is applied to the bases (chiefly lime) which neutralize the N-5 nitric acid in the method for determining active phosphoric acid and active potash. This term is used as a convenient one for the determination referred to, and does not imply that it is the best method for determination of basicity of the soil. If all the N-5 acid used is neutralized, the basicity is 10 per cent. or 200,000 pounds carbonate of lime, to 2,000,000 pounds of the soil.

Acidity is the amount of lime required to neutralize the soil as ascertained by the Veitch method. Acidity is discussed in Bulletin 243.

Corn possibility represents the amount of plant food which is withdrawn on an average in pot experiments from soils containing similar amounts of active phosphoric acid, active potash, or total nitrogen. It is based on 2,000,000 pounds of the soil or an acre to the depth of approximately 6 2-3 inches.

The corn possibility is not claimed to indicate the possible yield from the soil, as this depends upon other conditions in addition to the fertility of the soil. According to David D. Long, however, there is a close relation between the average yields of corn, oats, wheat, and cotton given by census reports for South-eastern States (and also for Texas) and the corn possibility as shown by the chemical analysis of some common types of soil, converted into terms of these other crops. (The Fertilizer Green Book, December 1922). The corn possibility is a convenient way of comparing the deficiency of various plant foods in the soil. For example, with the Caddo fine sandy loam of Camp county the corn possibility for active phosphoric acid is 18, for active potash 80, and for total nitrogen 23. The soil is probably deficient first in phosphoric acid, then in nitrogen, and is much less likely to be deficient in potash.

The experiments on which this interpretation is based are published in Bulletins 126, 145, 151, 178, and 267, and the method is described in Bulletin 213.

PLANT FOOD REQUIRED BY CROPS

Table 1 shows the estimated average quantity of plant food required by the yields given of certain crops.

TABLE 1.—ESTIMATED QUANTITY OF PLANT FOOD TAKEN UP BY CROPS, IN POUNDS PER ACRE.

	Phosphoric Acid	Nitrogen	Potash
Alfalfa, 4 tons	50	*183	143
Corn, 40 bushels	25	60	42
Cotton, 200 lbs. lint	14	50	30
Oats, 40 bushels	18	42	22
Onions, 30,000 lbs.	27	57	60
Potatoes, Irish, 100 bushels	13	27	40
Potatoes, Sweet, 200 bushels	18	37	65
Rice, 12 sacks	15	37	42
Sorghum hay, 3 tons	29	84	134
Sugar cane, 20 tons	15	153	144
Wheat, 25 bushels	18	42	22

*Part of this comes from the air.

POT EXPERIMENTS

The needs for plant food of a number of the soils discussed in this Bulletin were studied by growing the plants in pots containing portions of the soils, to which various forms of plant food were added. In making these experiments, 5,000 grams of soil were placed in a galvanized iron pot, and to one or two pots, a complete fertilizer KPN was added. To one or two more pots nitrogen and potash NK were added, phosphoric acid being omitted. The difference between this pot and the pot with the complete fertilizer shows the need of the soil for phosphoric acid. To one or two more pots, phosphoric acid and potash PK were added, nitrogen being omitted. The difference between this pot and that with the complete fertilizer shows the need of the soil for nitrogen. To a third set of one or two pots, nitrogen and phosphoric acid NP were added, potash being omitted. The difference between this pot and the pot receiving the complete fertilizer shows the effect of potash. The tables show the weights of the crops secured with the different additions, and also the amounts of phosphoric acid, potash, or nitrogen removed from the pot by the plants grown in the experiments. This is expressed in bushels of corn to the acre. The soil in pot experiments is under favorable conditions, and it is possible for the plants to take up more plant food than would be the case under field conditions. It is also possible for a greater growth to be produced. There might be a considerable difference between the crop receiving complete fertilizer KPN, and the crop which had no potash, PN, in the amount of crop produced, and yet the crop produced without potash might be equal to the possibility of production under the climatic conditions prevailing. Thus the soil would appear deficient in the pot experiment, while for all practical purposes it would not be deficient. This is the reason why the plant food withdrawn is expressed in bushels of corn to the acre. It shows the relative possibility of the soil to furnish plant food for crops in pot experiments.

AVERAGE COMPOSITION OF THE SOILS OF COUNTIES STUDIED

The average composition of the soils of the various types, by counties, is given in Table 2. The upland soils are averaged separately from the alluvial, or bottom lands, because the bottom lands are usually very much richer soils. In these averages, types of limited extent are given the same weight as types of wide extent, but it did not seem advisable to prepare an average on the basis of the area occupied by each soil.

TABLE 2—AVERAGE COMPOSITION OF UPLAND AND BOTTOM LAND SOILS.

	Phosphoric Acid			Potash			Lime	Mag-nesia		
	Total Percent	Active Per Million	Nitrogen Percent	Total Percent	Acid Soluble Percent	Active Per Million	Acid Soluble Percent	Acid Soluble Percent	Basicity Percent	Acidity Percent
UPLAND—SURFACE SOILS										
Brazos County	.033	24	.081	.78	.17	172	.31	.27	.61	–
Camp County	.039	51	.055	.62	.08	173	.16	.13	.30	0
Ellis County	.122	74	.149	1.09	.45	297	3.07	1.42	5.45	0
Washington County	.034	67	.084	.64	.13	142	1.29	.29	2.29	0
UPLAND—SUBSOILS										
Brazos County	.031	10	.061	.77	.24	139	.48	.32	.71	–
Camp County	.034	19	.080	.72	.09	43	.24	.27	.72	–
Ellis County	.176	44	.141	1.01	.47	233	3.63	1.23	5.57	0
Washington County	.027	39	.082	.61	.19	83	1.68	.36	2.58	–
BOTTOM LAND—SURFACE SOILS										
Brazos County	.072	151	.088	1.40	.45	289	1.62	.39	2.75	0
Ellis County	.155	213	.188	1.56	.69	550	3.67	1.16	6.56	0
Washington County	.086	239	.096	1.62	.78	190	3.75	.84	6.21	0
BOTTOM LAND—SUBSOILS										
Brazos County	.055	104	.062	1.51	.70	199	1.66	.56	2.86	0
Ellis County	.143	195	.154	1.47	.59	345	1.76	3.17	6.82	0
Washington County	.094	164	.090	1.69	.73	210	3.98	.60	6.50	0

There is a remarkably close agreement between the average composition of the upland soils of Washington, Camp, and Brazos counties. The soils of Ellis county are much richer than the other three counties, and resemble the bottom lands of these counties.

CROP PRODUCTION POWER OF AVERAGE SOIL

Table 3 contains the number of crops of 40 bushels of corn that the plant food in two million pounds, or an acre to the depth of 6 2-3 inches of the average soil, would produce, provided all could be extracted by the plants. The total phosphoric acid could produce 40 to 65 crops of 40 bushels of corn, acid-soluble potash could produce 60 to 260 crops, and the total nitrogen 21 to 51 crops.

TABLE 3.—POUNDS PLANT FOOD TO TWO MILLION POUNDS AND NUMBER OF CROPS OF 40 BUSHELS CORN IT WOULD PRODUCE.

	Pounds Plant Food			Number of Crops		
	Phosphoric Acid	Nitrogen	Potash	Phosphoric Acid	Nitrogen	Potash
Brazos County, upland soils	660	1620	3400	26	27	81
Camp County, upland soils	780	1100	1600	31	18	38
Ellis County, upland soils	2440	2980	9000	98	50	214
Washington County, upland soils	680	1680	2600	27	28	62
Brazos County, bottom lands	1440	1760	9000	58	29	214
Ellis County, bottom lands	3100	3760	13000	124	63	329
Washington County, bottom lands	1720	1920	15600	69	32	371

Table 4 contains the corn possibility of the average soils of these counties. The corn possibliity of the active phosphoric acid varies from 18 to 74 bushels, the active potash from 51 to 207, and the total nitrogen from 23 to 43 bushels. The wide difference between the upland soils and the bottom lands should be noted. These figures show the importance of nitrogen and phosphoric acid in the upland soils of Brazos, Camp, and Washington counties especially. They emphasize the need of proper legume rotation for the purpose of adding nitrogen to the soil from the air, and the use of fertilizer carrying phosphoric acid, together with some nitrogen, and in some cases potash, for the purpose of producing profitable crops.

TABLE 4.—CORN POSSIBILITY OF PLANT FOOD—BUSHELS TO TWO MILLION POUNDS SOIL.

	Active Phosphoric Acid	Total Nitrogen	Active Potash
Brazos County, upland soils	18	28	80
Camp County, upland soils	30	19	80
Ellis County, upland soils	35	43	120
Washington County, upland soils	35	28	51
Brazos County, bottom land soils	45	28	120
Ellis County, bottom land soils	50	48	182
Washington County, bottom land soils	50	28	80

SOILS OF BRAZOS COUNTY

Brazos county is in the east central part of Texas, about 150 miles north of the Gulf of Mexico. The elevation ranges from about 200 to 400 feet above sea level. It is bounded on one side by the Brazos river and on the other side by the Navasota river, which unite at the southern extremity of the county. Extensive fertile bottom lands occur along the rivers and streams. About 80 per cent. of the land is upland, and 20 per cent. bottom land. The county is level or gently rolling. The chief crop is cotton, although small amounts of corn, oats, hay, peanuts, and vegetables are produced.

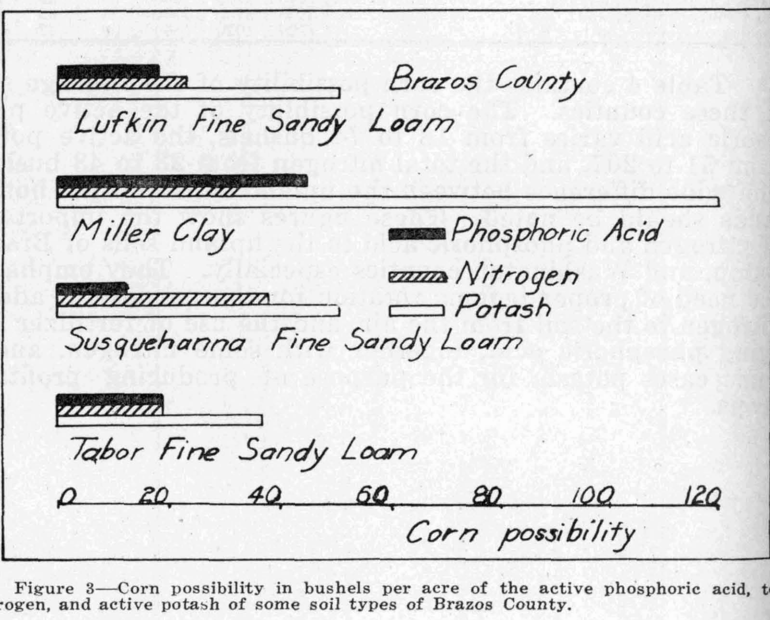

Figure 3—Corn possibility in bushels per acre of the active phosphoric acid, total nitrogen, and active potash of some soil types of Brazos County.

Table 5 contains the acreage and percentage of the various types of soils which occur in Brazos County. Thirty types are mapped, divided into thirteen series.

The Lufkin fine sandy loam occupies about forty per cent. of the county, the Susquehanna fine sandy loam 11 per cent. and the Tabor fine sandy loam 8 per cent. These three are upland soils. The Miller clay, which is a very productive and durable alluvial soil, occupies 7.9 per cent. of the county. The average composition of the upland soils and of the bottom lands is given in Table 2. It is seen from the table that the uplands are lower in plant food than the bottom lands as is always the case.

The chemical composition of the various types of soils is contained in Table 6. Table 5 contains the interpretation of the analyses of the various soil types.

TABLE 5.—INTERPRETATION OF ANALYSES. BRAZOS COUNTY.

Laboratory Number		Phosphoric Acid	Potash	Lime	Acidity	Corn possibility two million pounds: Active Phosphoric Acid	Total nitrogen	Active Potash	Acres	Per cent of area
8373–12653	Bastrop fine sandy loam—surface	good	good	good	0	12	18	120	960	0.3
8374–12654	Bastrop fine sandy loam—subsoil	low	good	good	0	18	18	120	......	.....
8383–12655	Bastrop sand—surface	fair	good	good	0	24	13	51	832	0.2
8384–12656	Bastrop sand—subsoil	fair	fair	good	0	35	8	51	......	.....
8365–12657	Bell clay—surface	good	good	high	0	45	38	157	2,624	0.7
8366–12658	Bell clay—subsoil	good	good	high	0	35	23	120	......	.....
12663–8381	Crockett clay—surface	good	good	high	0	12	38	120	1,728	0.5
12664–8382	Crockett clay—subsoil	good	good	good	0	6	33	80	......	.....
8345–8375–12669	Crockett clay loam—surface	good	fair	good	—	6	33	51	11,072	3.0
8346–8376	Crockett clay loam—subsoil	good	good	high	0	6	28	51	......	.....
12665–8335	Crockett fine sandy loam—surface	low	low	good	0	12	23	37	9,344	2.5
12666–8336	Crockett fine sandy loam—subsoil	fair	good	fair	0	6	23	51	......	.....
12667	Crockett loam—surface	good	fair	good	1100	18	28	120	4,736	1.3
12668	Crockett loam—subsoil	good	fair	good	0	18	23	120	......	.....
8343–12677–8329	Lufkin clay loam—surface	low	good	good	0	24	23	120	4,992	1.3
8344–12678–8330	Lufkin clay loam—subsoil	low	good	good	0	12	18	120	......	.....
1956–4229–14991–12910–12673	Lufkin fine sandy loam—surface	low	good	good	0	18	23	51	148,928	40.3
5937–6955–12470–18999–4230–4231–5938–6956–12471–19000–18911–12674	Lufkin fine sandy loam—subsoil	low	good	good	0	12	18	37	......	.....
8387	Lufkin gravely fine sandy loam—surface	low	low	good	0	6	13	.....	......	.....
8388	Lufkin gravely fine sandy loam—subsoil	low	good	fair	0	6	18	51	......	.....
8371–8379–12649	Miller clay—surface	good	good	high	0	45	33	120	29,376	7.9
8372–8380–12650	Miller clay—subsoil	good	good	high	0	35	23	120	......	.....
8369	Miller fine sand—surface	fair	good	high	0	50	13	37	......	.....
8370	Miller fine sand subsoil	fair	high	high	0	50	13	120	......	.....
12647–8359–8349	Miller fine sandy loam—surface	good	good	high	0	50	18	120	5,632	1.5
12648–8360–8350	Miller fine sandy loam—subsoil	good	good	high	0	35	18	51	......	.....
8363–8341	Norfolk fine sand—surface	low	low	good	0	24	18	51	8,384	2.3
8364–8342	Norfolk fine sand–subsoil	low	low	good	0	12	8	37	......	.....
8357	Ochlockonee clay—surface	good	good	high	0	45	38	182	3,200	0.9
8358	Ochlockonee clay—subsoil	good	good	high	0	18	28	80	......	.....
8353–12675	Ochlockonee fine sandy loam—surface	good	low	good	0	30	23	80	10,688	2.9
8354–12676	Ochlockonee fine sandy loam—subsoil	fair	low	fair	0	12	18	51	......	.....
8331	Ochlockonee silt loam—surface	good	good	good	0	45	33	182	3,712	1.0
8332	Ochlockonee silt loam—subsoil	good	good	good	0	18	23	80	......	.....
8333–12645	Pledger clay—surface	good	good	high	0	50	38	207	1,984	0.5
8334–12646	Pledger clay—subsoil	good	good	high	0	50	28	157	......	.....

TABLE 5.—INTERPRETATION OF ANALYSES. BRAZOS COUNTY.—Concluded

Laboratory Number		Phosphoric Acid	Potash	Lime	Acidity	Corn possibility two million pounds: Active Phosphoric Acid	Total nitrogen	Active Potash	Acres	Per cent of area
8389	Susquehanna clay—surface	good	good	fair	7800	6	38	120	1,280	0.3
8390	Susquehanna clay—subsoil	low	good	low	3800	6	18	80		
8337–8391–8395–12671	Susquehanna fine sandy loam—surface	fair	low	fair	0	12	38	51	41,792	11.3
8338–8392–8396–12672	Susquehanna fine sandy loam—subsoil	low	low	good	0	6	18	37		
8393	Susquehanna gravely fine sandy loam—surface	low	low	fair	0	12	13	37		
8394	Susquehanna gravely fine sandy loam—subsoil	low	low	low	2800	6	18	51		
8351–8367–12661–6953	Tabor fine sandy loam—surface	low	low	fair	0	18	18	37	30,592	8.3
8352–8368–12662–6954	Tabor fine sandy loam—subsoil	low	good	fair	0	6	18	51		
8377	Tabor sandy loam—surface	low	low	good	0	12	13	51		
8378	Tabor sandy loam—subsoil	fair	good	fair	0	6	18	51		
8385–12643	Trinity clay—surface	good	good	high	0	18	43	182		
8386–12644	Trinity clay—subsoil	good	good	high	0	12	28	120	23,611	6.4
12641	Trinity fine sandy loam—surface	good	fair	good	0	35	18	51	1,216	0.3
12642	Trinity fine sandy loam—subsoil	low	good	good	0	6	18	51		
8355–12639	Wilson clay—surface	good	good	high	0	30	28	157	1,216	0.3
8356–12640	Wilson clay—subsoil	low	good	high	0	12	18	80		
8361–12659	Wilson clay loam—surface	good	good	good	0	30	33	120	7,744	2.1
8339–12679	Wilson fine sandy loam—surface	low	fair	good	0	24	28	51	3,968	1.1
8340–12680	Wilson fine sandy loam—subsoil	low	fair	good	0	6	23	37		
12651–8347	Yahola silt loam—surface	good	good	high	0	50	33	157	10,304	2.8
12652–8348	Yahola silt loam—subsoil	good	good	high	0	(74)	18	120		

An examination of the analyses shows that legume rotation is needed for the purpose of supplying nitrogen and vegetable matter, and that fertilizers containing phosphoric acid especially are needed on the upland soils of this county. The soils are generally well supplied in potash, but upland soils especially need nitrogen and phosphoric acid. Some of the bottom lands contain so much nitrogen that they produce an excessive growth of stalk, and need phosphoric acid to balance the nitrogen, produce a smaller plant and a larger quantity of fruit. A few of the soils, such as some samples of the Lufkin clay loam, Lufkin fine sandy loam, and Susquehanna clay, are acid, and the use of lime is advisable upon some of them, in connection with a legume rotation. The proper use of lime on the heavier upland soils, together with a legume rotation, will cause the land to work up better under the plow, assume a better tilth, hold moisture better, stand dry weather better, and thereby enable it to produce better crops.

The greatest need of the upland soils of this county is a legume rotation, accompanied by the use of phosphoric acid in fertilizers, and in some cases the use of lime. The agriculture of the county cannot be considered as on a stable basis before legume rotations have been adopted.

TABLE 6.—BRAZOS COUNTY SOILS CHEMICAL COMPOSITION

		Phosphoric Acid			Potash							
		Total Percent	Active Per Million	Nitrogen Percent	Total Percent	Acid Soluble Percent	Active Per Million	Lime Acid Soluble Percent	Magnesia Acid Soluble Percent	Basicity Percent	Acidity Per Million	Sulphur Trioxide Percent
8373	Bastrop fine sandy loam—surface	.025	20.0	.032	.92	.10	142.5	.19	.13	.15	0	0.21
12653	Bastrop fine sandy loam—surface	.076	12.0	.065	1.06	.39	328.7	.61	.45	1.70	0	....
	AVERAGE	.051	16.0	.049	.99	.25	235.6	.40	.29	.93	0	0.21
8374	Bastrop fine sandy loam—subsoil	.030	10.0	.058	1.16	.58	231.2	.22	.30	.55	0	0.14
12654	Bastrop fine sandy loam—subsoil	.030	32.0	.040	1.08	.28	176.2	.46	.08	.45	0	0.05
	AVERAGE	.030	21.0	.049	1.61	.43	203.7	.34	.19	.50	0	0.10
8383	Bastrop sand—surface	.022	58.1	.034	.44	.13	107.5	.36	.13	.30	0	0.14
12655	Bastrop sand—surface	.048	12.0	.025	.83	.08	147.5	.19	.10	.24	0	0.03
	AVERAGE	.035	35.1	.030	.64	.11	127.5	.28	.12	.27	0	0.09
8384	Bastrop sand—subsoil	.035	53.1	.020	.34	.10	88.7	.22	.14	.00	0	0.12
12656	Bastrop sand—subsoil	.026	79.0	.020	.88	.09	125.0	.12	.13	.08	0	0.03
	AVERAGE	.031	66.1	.020	.61	.10	106.9	.17	.14	.04	0	0.08
8365	Bell clay—surface	.055	88.7	.135	1.06	.68	391.2	1.58	.58	3.10	0	0.28
12657	Bell clay—surface	.073	172.0	.144	1.14	.46	367.5	1.00	.78	2.03	0	0.10
	AVERAGE	.064	130.4	.125	1.10	.57	379.4	1.29	.68	2.57	0	0.19
8366	Bell clay—subsoil	.046	78.7	.086	1.17	.76	297.5	1.38	.56	.26	0	0.24
12658	Bell clay—subsoil	.055	61.0	.074	1.01	.45	231.9	.56	.86	1.43	0	0.05
	AVERAGE	.051	69.9	.080	1.09	.61	264.7	.97	.71	.85	0	.15
12663	Crockett clay—surface	.061	15.0	.115	1.23	.51	353.7	.82	1.44	2.80	0	0.10
8381	Crockett clay—surface	.065	7.5	.165	.57	.31	206.2	.43	.40	.95	0	0.17
	AVERAGE	.063	11.3	.140	.90	.41	280.0	.63	.92	1.88	0	.14
12664	Crockett clay—subsoil	.047	12.0	.092	1.16	.45	233.7	.48	2.00	2.73	0	0.10
8382	Crockett clay—subsoil	.059	5.0	.112	.55	.16	153.7	.33	.43	.95	0	0.15
	AVERAGE	.053	8.5	.102	.86	.31	193.7	.41	1.22	1.84	0	0.13
8345	Crockett clay loam—surface	.044	9.4	.132	.48	.16	121.2	.35	.29	.90	0	0.22
8375	Crockett clay loam—surface	.027	6.2	.111	.62	.11	98.7	.18	.14	.40	230	0.14
12669	Crockett clay loam—surface	.035	2.2	.091	.53	.09	84.0	.31	.25	.58	460	0.08
	AVERAGE	.035	5.9	.111	.54	.12	101.3	.28	.23	.63	—	.15
8346	Crockett clay loam—subsoil	.036	8.1	.090	.39	.90	128.7	2.42	.60	.65	230	0.19
8376	Crockett clay loam—subsoil	.035	5.0	.081	.71	.28	108.7	.31	.29	.85	0	0.15
	AVERAGE	.036	6.6	.086	.55	.59	118.7	1.37	.45	.75	—	0.17
12665	Crockett fine sandy loam—surface	.023	16.0	.046	.80	.06	64.0	.19	.14	.30	0	0.07
8335	Crockett fine sandy loam—surface	.032	7.5	.095	.74	.12	51.2	.22	.09	.30	0	0.18
	AVERAGE	.028	11.8	.071	.77	.09	57.6	.21	.12	.30	0	0.13
12666	Crockett fine sandy loam—subsoil	.026	12.0	.053	.84	.07	46.2	.17	.08	.55	0	0.05
8336	Crockett fine sandy loam—subsoil	.039	5.6	.078	.47	.26	195.0	.19	.25	.05	0	0.17
	AVERAGE	.033	8.8	.066	.66	.17	120.6	.18	.17	.30	0	0.11
12667	Crockett loam—surface	.041	21.0	.092	.62	.13	299.3	.24	.18	.45	1100	.07
12668	Crockett loam—subsoil	.036	21.0	.074	.76	.12	221.2	.23	.19	.48	0	.07
8343	Lufkin clay loam—surface	.019	8.7	.072	1.08	.18	100.0	.30	.21	.48	230	—
12677	Lufkin clay loam—surface	.037	81.0	.077	.62	.25	539.0	.56	.50	1.00	0	.12

TABLE 6.—BRAZOS COUNTY SOILS CHEMICAL COMPOSITION.—Continued

		Phosphoric Acid			Potash							
		Total Percent	Active Per Million	Nitrogen Percent	Total Percent	Acid Soluble Percent	Active Per Million	Lime Acid Soluble Percent	Magnesia Acid Soluble Percent	Basicity Percent	Acidity Per Million	Sulphur Trioxide Percent
8329	Lufkin clay loam—surface	.011	8.7	.072	.72	.06	90.0	.29	.15	.30	0	.06
	AVERAGE	.023	32.8	.074	.81	.16	243.0	.38	.29	.59	—	.09
8344	Lufkin clay loam—subsoil	.021	7.5	.060	.90	.25	105.0	.40	.27	1.10	0	.20
12678	Lufkin clay loam—subsoil	.023	20.6	.040	1.06	.25	573.7	.60	.47	1.29	0	0.10
8330	Lufkin clay loam—subsoil	.025	14.4	.063	.56	.19	52.5	.50	.29	.85	900	.20
	AVERAGE	.023	14.2	.054	.84	.23	243.7	.50	.34	1.08	—	.17
1956	Lufkin fine sandy loam—surface	.037	75.3	.033	1.59	.07	106.0	.33	.06	.15	0	.05
4229	Lufkin fine sandy loam—surface	.025	54.4	.101	.57	.12	135.0	.43	.07	.41	300	....
14991	Lufkin fine sandy loam—surface	.032	—	.044	.58	—	—	.26	.13	.16	0	....
4566	Lufkin fine sandy loam—surface	.018	18.8	.099	.82	.11	143.7	.26	.18	.80	0	....
5937	Lufkin fine sandy loam—surface	—	34.4	.047	1.18	.12	120.0	.12	.11	.34	0	....
6955	Lufkin fine sandy loam—surface	.027	24.4	.047	.76	.05	113.7	.07	.10	.00	200	.07
12470	Lufkin fine sandy loam—surface	.037	9.4	.076	1.16	.20	128.7	.32	.28	.40	900	0.08
18999	Lufkin fine sandy loam—surface	.038	17.0	.096	.54	—	95.0	—	—	.31	460	0.08
18910	Lufkin fine sandy loam—surface	.032	18.0	.054	1.00	1.00	117.5	—	—	.58	230	.04
12673	Lufkin fine sandy loam—surface	.012	7.1	.054	.58	.03	116.0	.17	.14	.35	0	.09
	AVERAGE	.029	28.8	.065	.88	.21	119.5	.24	.13	.35	—	.07
4230	Lufkin fine sandy loam—subsoil	.023	13.2	.073	.69	.13	68.7	.56	.09	.46	300	....
4231	Lufkin fine sandy loam—subsoil	.025	7.5	.055	.60	.25	77.5	.47	.28	1.12	0	....
5938	Lufkin fine sandy loam—subsoil	—	17.5	.031	1.05	.15	87.5	.35	.30	.66	0	....
6956	Lufkin fine sandy loam—subsoil	.026	8.7	.040	.97	.04	88.7	.06	.09	.05	200	.06
12471	Lufkin fine sandy loam—subsoil	.050	6.9	.085	1.02	.30	125.0	.52	.44	1.10	0	0.14
19000	Lufkin fine sandy loam—subsoil	.033	9.0	.078	.80	—	110.0	—	----	1.02	1100	.05
18911	Lufkin fine sandy loam—subsoil	.010	10.0	.047	.89	—	50.0	—	—	.49	0	.05
12674	Lufkin fine sandy loam—subsoil	.011	27.0	.052	.80	.07	87.9	.23	.20	.57	0	.07
	AVERAGE	.025	12.5	.058	.85	.16	86.9	.37	.23	.68	—	.07
8387	Lufkin gravely fine sandy loam—surface	.008	7.5	.036	.70	.08	—	.38	.29	.10	0	.10
8388	Lufkin gravely fine sandy loam—subsoil	.018	7.5	.053	.56	.24	101.2	.13	.14	.90	0	.13
8371	Miller clay—surface	.143	69.4	.111	2.05	1.10	125.0	7.80	.40	10.00	0	.17
8379	Miller clay—surface	.160	203.7	.111	1.82	.86	368.7	6.79	.36	10.00	0	.16
12649	Miller clay—surface	.106	117.5	.083	2.09	.56	256.2	.56	0.84	1.24	0	0.07
	AVERAGE	.136	130.2	.102	1.99	.84	249.7	5.05	.53	7.08	0	.13
8372	Miller clay—subsoil	.136	101.9	.095	2.26	1.34	325.0	6.70	.55	9.95	0	0.27
8380	Miller clay—subsoil	.076	28.7	.050	1.60	.70	178.7	9.11	.44	10.00	0	0.18
12650	Miller clay—subsoil	.052	60.0	.075	2.36	.90	230.0	.66	1.71	1.49	0	0.06
	AVERAGE	.088	63.5	.073	2.07	.98	244.6	5.49	.90	7.15	0	.17
8369	Miller fine sand—surface	.065	269.4	.031	.82	.27	57.5	2.54	.20	5.02	0	0.21
8370	Miller fine sand—subsoil	.058	265.0	.028	1.27	2.45	241.2	2.98	.24	5.70	0	0.16
12647	Miller fine sandy loam—surface	.072	231.9	.047	1.81	.27	270.0	.29	.26	.79	0	0.05
8359	Miller fine sandy loam—surface	.062	285.6	.040	1.90	.31	182.5	4.15	.24	7.65	0	0.24
8349	Miller fine sandy loam—surface	.105	481.9	.088	2.00	.56	341.2	4.85	.33	7.90	0	0.13
	AVERAGE	.080	333.1	.058	1.91	.38	264.6	3.10	.28	5.45	0	0.14

TABLE 6.—BRAZOS COUNTY SOILS CHEMICAL COMPOSITION.—Continued.

		Phosphoric Acid			Potash							
		Total Percent	Active Per Million	Nitrogen Percent	Total Percent	Acid Soluble Percent	Active Per Million	Lime Acid Soluble Percent	Magnesia Acid Soluble Percent	Basicity Percent	Acidity Per Million	Sulphur Trioxide Percent
12648	Miller fine sandy loam—subsoil	.056	115.6	.047	2.08	.38	207.5	.32	.72	.74	0	.08
8360	Miller fine sandy loam—subsoil	.071	8.7	.043	1.68	.46	100.0	4.90	.32	9.10	0	.25
8350	Miller fine sandy loam—subsoil	.094	98.1	.055	1.97	.63	10.0	5.87	.27	10.00	0	.15
	Average	.074	74.1	.048	1.91	.49	105.8	3.70	.44	6.61	0	.16
8363	Norfolk fine sand—surface	.036	44.4	.044	.46	.05	92.5	.14	.01	.15	0	0.07
8341	Norfolk fine sand—surface	.020	21.6	.040	1.04	.05	123.8	.09	.07	.03	230	.18
	Average	.028	33.0	.042	.75	.05	108.2	.12	.04	.09	—	.13
8364	Norfolk fine sand—subsoil	.006	13.1	.019	.86	.04	77.5	.13	.10	.00	0	0.17
8342	Norfolk fine sand—subsoil	.015	10.0	.019	1.22	.06	116.2	.12	.05	.05	230	0.19
	Average	.011	11.6	.019	1.04	.05	96.9	.13	.08	.03	—	0.18
8357	Ochlockonee clay—surface	.056	116.2	.134	1.14	.41	418.7	.82	.29	1.00	0	0.23
8358	Ochlockonee clay—subsoil	.031	27.5	.089	1.14	.28	171.2	.62	.24	1.05	0	0.23
8353	Ochlockonee fine sandy loam—surface	.025	49.4	.063	.92	.12	200.0	.24	.19	.35	0	0.23
12675	Ochlockonee fine sandy loam—surface	.052	35.4	.080	1.10	.06	145.6	.19	.08	.27	0	.09
	Average	.039	42.4	.072	1.01	.09	172.8	.22	.14	.31	0	0.16
8354	Ochlockonee fine sandy loam—subsoil	.041	13.1	.057	1.06	.07	96.2	.22	.14	.30	0	0.19
12676	Ochlockonee fine sandy loam—subsoil	.028	21.5	.031	1.41	.06	122.5	.12	.06	.15	0	.07
	Average	.035	17.3	.044	1.24	.07	109.4	.17	.10	.23	0	.13
8331	Ochlockonee silt loam—surface	.072	123.8	.113	1.17	.25	406.2	.44	.14	.90	0	.08
8332	Ochlockonee silt loam—subsoil	.047	20.6	.075	1.29	.30	196.2	.41	.32	.85	0	.17
8333	Pledger clay—surface	.156	433.1	.126	2.54	1.53	680.0	2.41	.57	4.42	0	.19
12645	Pledger clay—surface	.148	364.4	.125	2.61	1.18	606.2	2.30	.21	4.62	0	.11
	Average	.152	348.8	.126	2.58	1.36	643.1	2.36	.39	4.52	0	.15
8334	Pledger clay—subsoil	.120	206.6	.075	2.44	1.44	207.5	4.45	.55	7.23	0	....
12646	Pledger clay—subsoil	.069	337.5	.105	2.72	1.55	485.0	1.96	3.26	3.53	0	.09
	Average	.095	272.1	.090	2.58	1.50	346.3	3.21	1.91	5.38	0	.09
8389	Susquehanna clay—surface	.075	10.0	.131	.81	.45	288.7	.26	.49	.65	2800	.15
8390	Susquehanna clay—subsoil	.067	6.2	.052	.98	.55	198.7	.16	.53	.35	3800	.16
8337	Susquehanna fine sandy loam—surface	.014	13.1	.335	.63	.05	58.7	.10	.07	.05	0	.15
8391	Susquehanna fine sandy loam—surface	.021	13.1	.028	.52	.07	110.0	.08	.06	.00	0	.05
8395	Susquehanna fine sandy loam—surface	.040	8.1	.078	.79	.11	91.2	.15	.10	4.00	0	.12
12671	Susquehanna fine sandy loam—surface	.119	39.0	.051	1.31	.10	190.2	.17	.09	.37	0	.13
	Average	.049	18.3	.123	.81	.08	112.5	.15	.08	1.47	0	.11
8338	Susquehanna fine sandy loam—subsoil	.008	5.0	.035	.68	.25	61.2	.23	.20	.55	1100	.10
8392	Susquehanna fine sandy loam—subsoil	.025	5.6	.040	.81	.37	23.0	.15	.14	.35	230	.08
8396	Susquehanna fine sandy loam—subsoil	.024	5.0	.061	.78	.34	111.2	.17	.28	.60	1600	.06
12672	Susquehanna fine sandy loam—subsoil	.033	15.0	.081	.94	.17	189.0	.47	.54	.85	0	.10
	Average	.023	7.7	.054	.80	.28	96.1	.26	.29	.59	—	.09
8393	Susquehanna grvly. fine sdy. loam—surface	.005	13.1	.035	.65	.06	80.0	.19	.04	.00	0	.14
8394	Susquehanna grvly. fine sdy. loam—subsoil	.030	6.2	.060	.59	.03	142.5	.10	.18	.50	2800	.13
8351	Tabor fine sandy loam—surface	.014	8.1	.060	.45	.05	48.7	.23	.12	.10	0	.20
8367	Tabor fine sandy loam—surface	.008	11.2	.029	.64	.06	100.0	.11	0.05	.00	0	0.19

TABLE 6.—BRAZOS COUNTY SOILS CHEMICAL COMPOSITION.—Concluded.

		Phosphoric Acid			Potash							
		Total Percent	Active Per Million	Nitrogen Percent	Total Percent	Acid Soluble Percent	Active Per Million	Lime Acid Soluble Percent	Magnesia Acid Soluble Percent	Basicity Percent	Acidity Per Million	Sulphur Trioxide Percent
12661	Tabor fine sandy loam—surface	.036	46.0	.067	.43	.11	108.7	.17	.08	.30	0	.04
6953	Tabor fine sandy loam—surface	.029	45.6	.042	.39	.05	98.7	.10	.08	.10	200	.05
	AVERAGE	.022	27.7	.050	.48	.07	89.0	.15	.23	.13	—	.12
8352	Tabor fine sandy loam—subsoil	.028	5.6	.052	.52	.24	73.7	.19	.26	.70	0	.21
8368	Tabor fine sandy loam—subsoil	.020	6.2	.057	.63	.28	165.0	.09	.17	.15	700	.22
12662	Tabor fine sandy loam—subsoil	.034	7.0	.088	.69	.24	103.7	.18	.27	.75	0	.06
6954	Tabor fine sandy loam—subsoil	.024	6.2	.030	.47	.07	68.7	.06	.11	.05	200	.06
	AVERAGE	.027	6.3	.057	.58	.21	102.8	.13	.21	.41	—	.14
8377	Tabor sandy loam—surface	.012	15.0	.031	1.11	.06	107.5	.21	.08	.10	0	.05
8378	Tabor sandy loam—subsoil	.041	3.7	.059	1.15	.17	106.2	.15	.16	.55	0	.11
8385	Trinity clay—surface	.026	13.1	.126	1.03	.20	130.0	.51	.31	.80	0	.16
12643	Trinity clay—surface	.074	43.1	.157	2.14	.86	441.2	1.18	1.86	2.33	0	.10
	AVERAGE	.050	28.1	.142	1.59	.53	285.6	.85	1.09	1.57	0	.13
8386	Trinity clay—subsoil	.025	13.1	.088	.92	.19	125.0	.50	.19	1.10	0	.15
12644	Trinity clay—subsoil	.049	24.4	.108	2.17	.98	346.2	.73	1.87	1.94	0	.07
	AVERAGE	.037	18.8	.098	1.55	.59	235.6	.62	1.03	1.52	0	.11
12641	Trinity fine sandy loam—surface	.032	75.0	.052	1.19	.15	133.7	.31	0.16	.74	0	.05
12642	Trinity fine sandy loam—subsoil	.028	7.5	.054	1.23	.48	132.5	.50	.19	.89	0	.06
8355	Wilson clay—surface	.046	46.2	.117	.92	.50	400.0	.81	.31	1.55	0	.09
12639	Wilson clay—surface	.040	43.7	.065	.87	.33	238.7	.62	.61	1.39	0	.08
	AVERAGE	.043	45.0	.091	.90	.42	319.4	.72	.46	1.47	0	.09
8356	Wilson clay—subsoil	.027	15.0	.064	.89	.49	158.7	.71	.26	1.55	0	.18
12640	Wilson clay—subsoil	.029	21.9	.055	.70	.32	183.7	4.73	.59	1.39	0	.06
	AVERAGE	.028	18.5	.060	.80	.41	171.2	2.72	.43	1.47	0	.12
8361	Wilson clay loam—surface	.031	18.1	.110	.68	.13	161.2	.29	.20	.65	0	.23
12659	Wilson clay loam—surface	.070	102.0	.122	.98	.40	325.0	.54	.52	.90	0	.09
	AVERAGE	.051	60.0	.116	.83	.27	243.1	.42	.36	.78	0	.16
1809	Wilson fine sandy loam—surface	.024	77.8	.105	.94	.13	228.1	.59	.88	1.20	0	......
8339	Wilson fine sandy loam—surface	.013	13.1	.070	.72	.12	81.9	.24	.11	.38	0	.08
12679	Wilson fine sandy loam—surface	.028	19.2	.072	.91	.07	83.8	.27	.15	.53	0	.12
	AVERAGE	.022	36.7	.083	.86	.11	131.3	.37	.38	.70	0	.10
8340	Wilson fine sandy loam—subsoil	.011	9.4	.059	.73	.14	78.7	.34	.21	.70	0	.16
12680	Wilson fine sandy loam—subsoil	.024	8.1	.069	.45	.14	82.5	.32	.27	.65	0	.06
	AVERAGE	.018	8.8	.064	.59	.14	80.6	.33	.24	.68	0	.11
12651	Yahola silt loam—surface	.113	326.0	.092	1.95	.54	358.7	6.23	1.09	9.48	0	.07
8347	Yahola silt loam—surface	.089	313.5	.118	2.13	.73	411.2	.62	.36	1.23	0	.08
	AVERAGE	.101	319.8	.105	2.04	.64	385.0	3.43	.73	5.36	0	.08
12652	Yahola silt loam—subsoil	.099	380.0	.057	1.89	1.44	265.0	4.22	1.17	8.30	0	.08
8348	Yahola silt loam—subsoil	.114	471.9	.056	2.30	.18	185.0	.45	.40	4.50	0	.17
	AVERAGE	.107	426.0	.057	2.10	.81	225.0	2.34	.79	6.40	0	.13

POT EXPERIMENTS ON SOILS OF BRAZOS COUNTY

A large number of pot experiments have been made on the soils of Brazos County, and the results of these are given in Table 7. These results are averages of two crops, in most cases. The weights of the crops are given in the first two columns. The plant food withdrawn in the pot experiment, expressed in bushels of corn to the acre, is given in the next three columns. The last three columns contain the corn possibility of the soils based upon the chemical analyses, for the purpose of comparison with the pot experiments. The results are not always the same, as could be expected, but the agreement is usually good.

TABLE 7.—POT EXPERIMENTS—BRAZOS COUNTY

		Weight Crops in Grams				Corn Possibility of Plant Food Withdrawn		
		Complete Fertilizer	No Phosphoric Acid	No Nitrogen	No Potash	Phosphoric Acid	Nitrogen	Potash
12653	Bastrop fine sandy loam—surface corn 1919	41.5	29.3	19.5	37.2	46	29	436
12653	Bastrop fine sandy loam—surface sorghum 1919	33.6	29.6	7.6	31.6	44	11	186
	AVERAGE	37.6	29.5	13.6	34.4	45	20	311
12654	Bastrop fine sandy loam—subsoil corn 1919	32.6	9.7	10.5	—	15	25	—
12654	Bastrop fine sandy loam—subsoil sorghum 1919	33.2	25.2	4.0	—	30	7	—
	AVERAGE	32.9	17.5	7.3	—	22	16	—
12655	Bastrop sand—surface corn 1919	41.1	30.6	11.1	33.6	36	16	191
12655	Bastrop sand—surface sorghum 1919	26.5	18.9	2.2	18.3	29	5	79
	AVERAGE	33.8	24.8	6.7	26.0	32	10	135
12656	Bastrop sand—subsoil corn 1919	46.1	44.3	24.6	45.5	65	37	178
12656	Bastrop sand—subsoil sorghum 1919	33.8	33.3	2.2	21.7	30	4	78
	AVERAGE	40.0	38.8	13.4	33.6	47	20	128
12657	Bell clay—surface corn 1919	35.2	30.8	34.4	38.5	47	77	720
12657	Bell clay—surface sorghum 1919	34.5	34.8	12.1	37.3	33	24	305
	AVERAGE	34.8	32.8	23.3	37.9	40	50	513
12658	Bell clay—subsoil corn 1919	34.9	21.6	28.1	26.1	33	56	311
12658	Bell clay—subsoil sorghum 1919	37.3	33.4	6.0	28.7	45	11	158
	AVERAGE	36.1	27.5	17.1	27.4	39	33	235
12663	Crockett clay—surface corn 1919	25.8	13.7	—	—	21	—	—
12663	Crockett clay—surface sorghum 1919	27.7	16.5	—	—	21	—	—
	AVERAGE	26.8	15.1	—	—	21	—	—
12664	Crockett clay—subsoil corn 1919	13.9	4.7	—	—	7	—	—
12664	Crockett clay—subsoil sorghum 1919	33.0	18.7	—	—	22	—	—
	AVERAGE	23.5	11.7	—	—	15	—	—

TABLE 7.—POT EXPERIMENTS—BRAZOS COUNTY—Continued.

		WEIGHT CROPS IN GRAMS				CORN POSSIBILITY OF PLANT FOOD WITHDRAWN		
		Complete Fertilizer	No Phosphoric Acid	No Nitrogen	No Potash	Phosphoric Acid	Nitrogen	Potash
12665	Crockett fine sandy loam—surface corn 1919	49.8	17.8	17.7	—	21	26	—
12665	Crockett fine sandy loam—surface sorghum 1919	31.7	20.8	7.0	—	27	12	—
	AVERAGE	40.8	19.3	12.4	—	24	19	—
12666	Crockett fine sandy loam—subsoil corn 1919	40.9	5.1	15.2	—	6	26	—
12666	Crockett fine sandy loam—subsoil sorghum 1919	30.8	15.8	3.9	—	21	8	—
	AVERAGE	35.9	10.5	9.6	—	14	17	—
12667	Crockett fine sandy loam—surface corn 1919	38.3	14.3	25.8	—	16	38	—
12667	Crockett fine sandy loam—surface sorghum 1919	27.4	25.4	13.5	—	36	31	—
	AVERAGE	32.9	19.9	19.7	—	26	35	—
12668	Crockett fine sandy loam—subsoil corn 1919	44.2	9.8	22.5	46.5	13	38	390
12668	Crockett fine sandy loam—subsoil sorghum 1919	38.9	22.4	6.2	27.1	26	12	82
	AVERAGE	41.6	16.1	14.4	36.7	19	25	236
12677	Lufkin clay loam—surface corn 1919	36.1	25.2	18.6	29.0	32	39	617
12677	Lufkin clay loam—surface sorghum 1919	32.7	25.7	7.4	32.6	25	23	392
	AVERAGE	31.4	25.5	13.0	30.8	28	31	505
12678	Lufkin clay loam—subsoil corn 1919	24.6	11.1	8.6	22.1	18	14	423
12678	Lufkin clay loam—subsoil sorghum 1919	45.6	25.3	3.3	34.3	24	7	357
	AVERAGE	35.1	18.2	6.0	28.2	21	11	390
1956	Lufkin fine sandy loam—surface corn 1921	28.2	19.2	14.6	—	—	—	—
1956	Lufkin fine sandy loam—surface sorghum 1921	16.9	15.0	2.8	—	—	—	—
1956	Lufkin fine sandy loam—surface corn 1911	21.8	—	—	4.0	—	—	—
1956	Lufkin fine sandy loam—surface sorghum 1912	21.8	—	—	15.3	—	—	—
	AVERAGE	22.2	17.1	8.7	9.7	—	—	—
5937	Lufkin fine sandy loam—surface corn 1914	48.7	—	31.0	—	—	37	—
5937	Lufkin fine sandy loam—surface sorghum 1914	42.2	—	6.7	—	—	11	—

TABLE 7.—POT EXPERIMENTS—BRAZOS COUNTY—Continued.

		WEIGHT CROPS IN GRAMS				CORN POSSIBILITY OF PLANT FOOD WITHDRAWN		
		Complete Fertilizer	No Phosphoric Acid	No Nitrogen	No Potash	Phosphoric Acid	Nitrogen	Potash
5937	Lufkin fine sandy loam—surface corn 1915	43.1	—	10.0	—	—	14	—
5937	Lufkin fine sandy loam—surface sorghum 1915	22.2	—	5.9	—	—	10	—
	Average	39.1	—	13.4	—	—	18	—
5938	Lufkin fine sandy loam—subsoil corn 1914	9.6	8.8	—	—	12	—	—
5938	Lufkin fine sandy loam—subsoil sorghum 1914	7.4	6.2	—	—	7	—	—
	Average	8.5	7.5	—	—	9	—	—
12470	Lufkin fine sandy loam—surface corn 1919	42.5	14.2	—	—	30	—	—
12470	Lufkin fine sandy loam—surface sorghum 1919	20.6	9.7	—	—	3	—	—
	Average	31.6	12.0	—	—	16	—	—
12471	Lufkin fine sandy loam—subsoil corn 1919	15.3	0.6	—	—	3	—	—
12471	Lufkin fine sandy loam—subsoil sorghum 1919	39.3	7.8	—	—	11	—	—
	Average	27.3	4.2	—	—	7	—	—
18999	Lufkin fine sandy loam—surface corn 1921	49.2	12.3	16.4	—	—	—	—
18999	Lufkin fine sandy loam—surface sorghum 1921	31.5	8.0	9.3	—	—	—	—
	Average	40.4	10.2	12.9	—	—	—	—
19000	Lufkin fine sandy loam—subsoil corn 1921	49.4	18.0	15.7	—	—	—	—
19000	Lufkin fine sandy loam—subsoil sorghum 1921	36.5	9.6	9.0	—	—	—	—
	Average	43.0	13.8	12.4	—	—	—	—
18910	Lufkin fine sandy loam—surface corn 1921	35.7	25.9	15.9	—	—	—	—
18910	Lufkin fine sandy loam—surface sorghum 1921	42.1	34.5	7.7	—	—	—	—
	Average	38.9	30.2	11.8	—	—	—	—
18911	Lufkin fine sandy loam—subsoil corn 1921	36.2	6.2	6.5	—	—	—	—
18911	Lufkin fine sandy loam—subsoil sorghum 1921	42.0	11.5	4.4	—	—	—	—
	Average	39.1	8.9	5.5	—	—	—	—

TABLE 7.—POT EXPERIMENTS—BRAZOS COUNTY—Continued.

		WEIGHT CROPS IN GRAMS				CORN POSSIBILITY OF PLANT FOOD WITHDRAWN		
		Complete Fertilizer	No Phosphoric Acid	No Nitrogen	No Potash	Phosphoric Acid	Nitrogen	Potash
12673	Lufkin fine sandy loam—surface corn 1919	39.1	20.3	29.6	—	29	46	—
12673	Lufkin fine sandy loam—surface sorghum 1919	36.5	25.7	12.9	—	26	27	—
	AVERAGE	37.4	23.0	21.3	—	27	36	—
12674	Lufkin fine sandy loam—subsoil corn 1919	38.9	7.8	28.3	36.7	11	53	58
12674	Lufkin fine sandy loam—subsoil sorghum 1919	30.6	23.2	10.1	18.6	25	22	36
	AVERAGE	34.8	15.5	19.2	27.7	18	38	47
12649	Miller clay—surface corn 1917	35.0	31.9	22.3	39.5	62	51	372
12649	Miller clay—surface sorghum 1917	22.8	22.0	9.5	18.3	54	12	125
12649	Miller clay—surface corn 1918	36.9	40.6	8.8	36.3	59	12	242
12649	Miller clay—surface sorghum 1918	29.5	17.8	16.1	23.0	15	27	130
	AVERAGE	31.1	28.1	14.2	29.3	47	26	217
12650	Miller clay—subsoil corn 1917	27.5	8.1	9.6	28.7	16	30	320
12650	Miller clay—subsoil sorghum 1917	21.3	15.2	3.4	18.4	21	5	88
12650	Miller clay—subsoil corn 1918	46.1	34.8	5.1	40.8	32	8	166
12650	Miller clay—subsoil sorghum 1918	32.7	19.7	2.9	21.9	18	6	111
	AVERAGE	31.9	19.5	5.3	27.5	22	13	171
12647	Miller sandy loam–surface corn 1917	31.9	26.6	9.5	32.7	62	11	313
12647	Miller fine sandy loam–surface sorghum 1917	20.8	19.3	10.2	20.3	33	14	132
12647	Miller fine sandy loam–surface corn 1918	38.4	36.9	6.7	36.9	46	9	124
12647	Miller fine sandy loam–surface sorghum 1918	24.9	25.0	8.5	22.3	23	11	82
	AVERAGE	29.0	27.0	8.7	28.1	41	11	163
12648	Miller fine sandy loam–subsoil corn 1917	28.3	17.6	6.3	28.4	35	13	245
12648	Miller fine sandy loam–subsoil sorghum 1917	24.8	20.9	5.2	21.8	38	8	115
12648	Miller fine sandy loam–subsoil corn 1918	41.8	31.8	2.8	32.2	36	7	93
12648	Miller fine sandy loam–subsoil sorghum 1918	24.3	23.8	4.5	21.8	21	8	89
	AVERAGE	29.8	23.5	4.7	26.1	32	9	136

TABLE 7.—POT EXPERIMENTS—BRAZOS COUNTY—Continued.

		WEIGHT CROPS IN GRAMS				CORN POSSIBILITY OF PLANT FOOD WITHDRAWN		
		Complete Fertilizer	No Phosphoric Acid	No Nitrogen	No Potash	Phosphoric Acid	Nitrogen	Potash
12676	Ochlockonee fine sandy loam–subsoil corn 1919	43.9	9.8	9.6	37.4	16	15	145
12676	Ochlockonee fine sandy loam–subsoil sorghum 1919	22.8	14.9	2.2	12.4	16	5	52
	AVERAGE	33.4	12.4	5.9	24.9	16	10	99
12645	Pledger clay–surface corn 1917	34.8	29.1	17.9	36.0	72	27	742
12645	Pledger clay–surface sorghum 1917	30.9	29.7	14.0	30.7	69	10	361
12645	Pledger clay–surface corn 1918	43.5	46.4	11.3	46.2	65	15	46
12645	Pledger clay–surface sorghum 1918	41.2	37.1	15.5	22.6	32	20	370
	AVERAGE	37.6	35.6	14.7	33.9	60	18	380
12646	Pledger clay–subsoil corn 1917	19.7	12.5	12.2	20.8	29	26	423
12646	Pledger clay–subsoil sorghum 1917	15.0	12.0	11.2	11.2	25	24	133
12646	Pledger clay–subsoil corn 1918	22.7	41.3	26.2	45.2	102	11	457
12646	Pledger clay–subsoil sorghum 1918	28.9	29.0	11.0	34.6	24	13	252
	AVERAGE	21.6	23.7	15.1	28.0	45	19	316
12671	Susquehanna fine sandy loam–surface corn 1919	43.0	36.8	12.5	43.8	47	17	237
12671	Susquehanna fine sandy loam–surface sorghum 1919	35.5	34.7	6.2	25.0	40	11	78
	AVERAGE	39.3	35.8	9.4	34.4	44	14	158
12672	Susquehanna fine sandy loam–subsoil corn 1919	22.9	3.3	10.0	—	5	20	—
12672	Susquehanna fine sandy loam–subsoil sorghum 1919	27.7	14.2	3.7	—	23	10	—
	AVERAGE	25.3	8.8	6.9	—	14	15	—
12661	Tabor fine sandy loam–surface corn 1919	37.8	35.3	23.2	37.0	48	41	144
12661	Tabor fine sandy loam–surface sorghum 1919	26.6	26.0	10.0	25.6	41	24	62
	AVERAGE	32.2	30.7	16.6	31.3	44	77	103
12662	Tabor fine sandy loam–subsoil corn 1919	24.2	3.5	27.0	—	5	118	—
12662	Tabor fine sandy loam–subsoil sorghum 1919	20.9	8.4	13.5	—	11	31	—
	AVERAGE	22.6	6.0	20.3	—	8	75	—

TABLE 7.—POT EXPERIMENTS—BRAZOS COUNTY.—Continued.

		WEIGHT CROPS IN GRAMS				CORN POSSIBILITY OF PLANT FOOD WITHDRAWN		
		Complete Fertilizer	No Phosphoric Acid	No Nitrogen	No Potash	Phosphoric Acid	Nitrogen	Potash
12643	Trinity clay–surface corn 1917	34.4	23.3	17.8	31.8	48	86	589
12643	Trinity clay–surface sorghum 1917	9.4	2.9	13.7	4.8	4	56	37
12643	Trinity clay–surface corn 1918	51.0	50.0	22.3	52.0	61	24	376
12643	Trinity clay–surface sorghum 1918	47.3	46.2	27.9	45.0	40	30	299
	AVERAGE	38.0	30.6	20.4	33.4	38	48	325
12644	Trinity clay–surface corn 1917	27.9	11.5	12.4	30.0	16	22	488
12644	Trinity clay–surface sorghum 1917	21.7	7.0	9.8	7.5	71	17	53
12644	Trinity clay–surface corn 1918	10.2	23.5	48.7	50.0	28	11	334
12644	Trinity clay–surface sorghum 1918	44.8	21.0	9.2	46.5	14	11	249
	AVERAGE	26.2	15.8	20.0	33.5	32	15	281
12641	Trinity fine sandy loam–surface corn 1917	26.3	11.5	7.8	29.2	41	12	136
12641	Trinity fine sandy loam–surface sorghum 1917	17.7	20.5	8.7	19.3	155	13	68
12641	Trinity fine sandy loam–surface corn 1918	25.9	25.6	12.9	26.7	21	16	63
12641	Trinity fine sandy loam–surface sorghum 1918	25.8	17.5	8.0	15.6	14	10	58
	AVERAGE	23.9	18.8	9.4	25.7	58	13	82
12642	Trinity fine sandy loam–subsoil corn 1917	38.6	7.6	8.7	30.9	12	12	160
12642	Trinity fine sandy loam–subsoil sorghum 1917	22.0	8.3	5.5	25.2	11	8	133
12642	Trinity fine sandy loam–subsoil corn 1918	37.1	10.4	3.9	31.3	13	5	107
12642	Trinity fine sandy loam–subsoil sorghum 1918	31.0	8.1	4.2	21.1	—	—	—
	AVERAGE	32.2	8.6	5.6	27.1	12	8	133
12639	Wilson clay—surface corn 1917	36.2	25.5	14.0	35.3	—	—	—
12639	Wilson clay—surface sorghum 1917	24.7	10.4	10.7	16.1	16	17	117
12639	Wilson clay—surface corn 1918	46.8	40.1	10.6	35.4	60	10	156
12639	Wilson clay—surface sorghum 1918	40.4	36.7	8.6	36.9	31	11	88
	AVERAGE	37.0	28.2	11.0	30.9	36	13	120
12640	Wilson clay—subsoil corn 1917	38.0	15.2	10.3	31.5	29	17	280
12640	Wilson clay—subsoil sorghum 1917	16.1	3.1	8.4	19.5	3	14	78

TABLE 7.—POT EXPERIMENTS—BRAZOS COUNTY.—Concluded.

		WEIGHT CROPS IN GRAMS				CORN POSSIBILITY OF PLANT FOOD WITHDRAWN		
		Complete Fertilizer	No Phosphoric Acid	No Nitrogen	No Potash	Phosphoric Acid	Nitrogen	Potash
12640	Wilson clay—subsoil corn 1918	40.5	28.6	3.8	36.3	30	6	131
12640	Wilson clay—subsoil sorghum 1918	33.4	20.4	7.8	27.3	18	9	76
	Average	32.0	16.8	7.6	28.6	20	11	141
12659	Wilson clay loam—surface corn 1919	41.9	35.9	32.3	22.5	34	70	317
12659	Wilson clay loam—surface sorghum 1919	35.8	29.5	12.9	36.9	38	32	307
	Average	38.9	32.7	22.6	29.7	36	51	312
12660	Wilson clay loam—subsoil corn 1919	30.1	17.0	22.5	26.7	22	50	240
12660	Wilson clay loam—subsoil sorghum 1919	48.0	44.2	9.7	49.0	42	82	184
	Average	39.1	30.6	16.1	37.9	32	66	212
1809	Wilson fine sandy loam—subsoil corn 1913	37.8	—	34.5	—	—	70	—
1809	Wilson fine sandy loam—subsoil sorghum 1913	43.1	—	8.5	—	—	17	—
1809	Wilson fine sandy loam—subsoil corn 1914	41.0	—	13.0	—	—	19	—
1809	Wilson fine sandy loam—subsoil sorghum 1914	29.0	—	6.2	—	—	13	—
	Average	37.7	—	15.6	—	—	30	—
12679	Wilson fine sandy loam—surface corn 1919	51.5	16.4	36.0	42.4	26	116	123
12679	Wilson fine sandy loam—surface sorghum 1919	36.6	12.8	7.5	21.2	17	18	32
	Average	44.1	14.6	21.8	31.8	21	67	77
12680	Wilson fine sandy loam—subsoil corn 1919	32.1	9.7	16.2	—	14	31	—
12680	Wilson fine sandy loam—subsoil sorghum 1919	15.7	9.3	4.5	—	13	11	—
	Average	23.9	9.5	10.4	—	14	21	—
12651	Yahola silt loam—surface corn 1919	34.8	27.1	24.7	26.6	40	—	456
12651	Yahola silt loam—surface sorghum 1919	41.3	35.2	11.2	42.0	53	19	329
	Average	38.1	31.2	18.0	34.3	46	19	393
12652	Yahola silt loam—subsoil corn 1919	27.4	10.8	14.5	18.1	14	25	300
12652	Yahola silt loam—subsoil sorghum 1919	27.4	18.1	4.9	25.1	27	12	229
	Average	27.4	14.5	9.7	21.6	21	18	264

The pot experiments on the soils of Brazos County confirm what has been said previously; namely, that soils of this county need a legume rotation to supply nitrogen and vegetable matter, and fertilizer to supply phosphoric acid, and, in some cases, need lime. The bottom lands are rich, and many do not need fertilizers, excepting where they produce too large a growth of stalk, and need phosphoric acid to balance the excess of nitrogen. But some bottom lands have been in cultivation a long time and now need plant food.

DESCRIPTION OF SOIL TYPES OF BRAZOS COUNTY

Bastrop fine sandy loam consists of a light-brown loamy fine sand, underlain at a depth of about 15 to 20 inches by a reddish-brown fine sandy loam, which, in turn, grades into a dull brownish-red or chocolate-red fine sandy clay. The subsoil is rather compact, but is less stiff and plastic than that of the Susquehanna soils, which in places it closely resembles.

This type is slightly higher than the Bell clay, with which it is associated, and is better drained. It is easily cultivated, and with the addition of small quantities of commercial fertilizer or the use of manure produces good yields of cotton and corn; although it is less durable and productive than the associated black soils. The soil is adapted to melons and early truck crops, but irrigation probably is necessary for success with such crops. Practically all of the type is under cultivation.

This type needs nitrogen, phosphoric acid, and legume rotation.

Bastrop sand occupies hummocks or low ridges about 10 to 15 feet above the clay depressions on the terraces. The soil is a loose, friable, loamy sand, grayish or light-brown in color, becoming reddish-brown with depth.

The type is utilized principally for cotton and corn, but under present methods of cultivation the yields are low. Peanuts and sweet potatoes should do well on this type.

The soil needs nitrogen especially. For sweet potatoes it is likely to need phosphoric acid, nitrogen, and potash. A legume rotation is needed.

Bell clay—The surface soil of the Bell clay is a black, sticky, tenacious clay. At about 12 to 18 inches the material becomes a very dark gray or bluish-black, highly plastic, impervious clay, which in places changes to dark drab in color at about 3 feet.

This type occupies a large part of the level terrace lying west, south, and southeast of Riverside. The land is for the most part level, although the drainage is fair. The type is mainly prairie.

The soil is sticky and tenacious when wet and unless very carefully handled tends to bake and become extremely hard upon drying. Large cracks appear during the dry weather of the summer. It is, however, a strong, durable soil, and in favorable years, produces one-half bale of cotton and 20 to 30 bushels of corn per acre. Green manures are beneficial for improving the tilth.

The soil is well supplied with plant food. It will probably need a legume rotation first.

Crockett clay generally consists of about 6 to 12 inches of a very compact, tough, black clay underlain by dark yellowish brown, stiff, clay grading into greenish-yellow clay. Rounded quartz and flint gravel, up to 3 to 4 inches in diameter, occur in places. The soil occurs on the steeper slopes and more eroded hills and is closely associated with clay loam.

This soil is intractable and difficult to plow to a depth of more than 3 to 4 inches, but is strong and durable and gives good yields of both corn and cotton without the aid of commercial fertilizers.

The samples examined are low in active phosphoric acid, and the pot experiments also show that phosphoric acid is needed. Vegetable matter and rotation on these lands would probably improve the tilth.

Crockett clay loam—This consists of about 5 to 12 inches of a dark brown to black loam, overlying stiff, reddish-brown or mottled brownish and red clay, which grades into yellow or greenish-yellow clay at depths of about 30 inches to 3 feet.

It is confined to the northern and northwestern parts of the county. The principal development is a narrow strip one-fourth to one mile wide lying along the San Antonio road and extending nearly across the county along the northern boundary.

Most of the land is gently rolling, well drained prairie. This type is largely under cultivation, although a small percentage is utilized for pastures and for the production of prairie hay. The Crockett loam is rather compact and stiff, and heavy implements and teams are necessary for the deep breaking of the land, but by judicious cultivation a good tilth can be maintained. The soil is strong and durable and more productive than the gray sandy types of the upland.

Cotton and corn are the principal crops. Yields of one-half bale of cotton and 30 bushels of corn are frequently obtained.

The samples examined are low in active phosphoric acid, and it is probable that the use of acid phosphate as a fertilizer would be of advantage. Some samples are acid, and additions of lime would probably improve the tilth, and better enable the soil to grow legumes. Vegetable matter would also improve the tilth.

Crockett fine sandy loam—This consists of about 12 to 18 inches of black to grayish-brown fine sandy loam, underlain to a depth of about 3 feet by a yellowish-brown or greenish-yellow, stiff, plastic, clay, mottled or streaked with dull red. The subsoil and substratum have a structure favorable for the retention of moisture.

The principal bodies of this soil occur in a belt one to three miles wide lying east of the San Antonio road and extending almost entirely across the county from the Brazos to the Navasota river bottoms. The land is gently rolling and fairly well drained. The lager part of this type was originally forested.

Probably 70 per cent of the total area of the type is under cultivation. The land can be plowed deeply without difficulty. Cotton and corn are the only crops grown to any extent. The yields are on the average slightly less than on the clay loam type, although some of the farmers are of the opinion that corn gives better results on the fine sandy loam in dry years.

The samples examined are low in phosphoric acid. A legume rotation is needed.

Crockett loam—This consists for the most part of dark-brown to black, moderately friable fine loam or silty loam, underlain at about 6 to 12 inches by dull brownish-yellow or brownish, silty clay loam, or clay, mottled with red. This passes into a yellowish clay of a stiff plastic nature, having much the same structural character as that of the other soils of the series.

This type occurs principally on Payne's Prairie, near Edge, while other areas of considerable size appear on the prairie 5 to 6 miles north of Bryan.

All the land is gently rolling, well-drained prairie, suitable for both cotton and corn. The soil is more friable than the clay loam and easier to cultivate. The average yield of cotton probably is a little over one-third bale, and of corn about 20 bushels per acre.

It is probable that larger yields of both corn and cotton would be secured through the use of acid phosphate to supply phosphoric acid and legume rotation to supply nitrogen and vegetable matter.

Lufkin clay loam—This consists generally of a thin covering of a grayish-brown fine sandy loam with an underlying stiff or tough, compact, drab clay, slightly mottled with dull yellow or brown. The friable surface material is only about 2 to 5 inches deep, and the heavy, stiff clay is turned up in plowing, the resulting soil having the texture of a clay loam.

The Lufkin clay loam occupies the higher ridges or stream divides and well-drained slopes along creeks. It occurs in association with other Lufkin soils, in widely separated areas, of about 10 to 200 or 300 acres, in the vicinity of Bryan, Kurten, Steep Hollow, and Wellborn.

A part of the Lufkin clay loam is under cultivation and is used for growing cotton and corn. In years of well-distributed rainfall good yields are obtained, but the average yields under present methods of cultivation are somewhat lower than those of typical Lufkin fine sandy loam.

The average corn possibility of the phosphoric acid and nitrogen are 24 bushels to the acre. The soil needs legume rotation, and possibly acid phosphate. One sample is acid, and lime in connection with a legume rotation would improve the physical character of the soil.

Lufkin fine sandy loam—This is the most widely distributed type of the series. The soil generally consists of about 10 to 20 inches of a grayish to grayish-brown, rather compact fine sandy loam underlain by drab clay faintly mottled with yellow. The clay subsoil is highly plastic and impervious.

The Lufkin fine sandy loam is widely distributed throughout the county and embraces a larger total area than any of the other soils. The largest and most nearly uniform areas occur in the central part of the county from Bryan southward to Millican. The State Experiment Station farm is located principally upon this type.

The topography is very gently rolling to nearly level or flat. Much of the land has fair drainage, but there is a considerable part in which the drainage is poor and the land wet and rather cold in the spring, although none of it is in a swampy condition. On level land the soil becomes very soggy after rains, on account of the impervious nature of the subsoil, which prevents the downward percolation of the water.

Most of the land is easily cultivated. The soil is not greatly injured if plowed when wet and can be cultivated much sooner after heavy rains than the clay or clay loam soils of the upland. Practically the whole type is arable, although only about one-half of it is now improved land.

The principal crops grown are cotton and corn. The average yields for the type as a whole are probably a little less than one-third bale of cotton or 15 bushels of corn per acre. Oats are grown, but the yields are low. Sorghum for forage gives fair results. Fruit trees are generally short-lived, the stiff impervious nature of the subsoil being apparently unfavorable for the growth of the trees, while their vitality is frequently lowered by severe droughts.

The corn possibility of the active phosphoric acid is 18 bushels and for the nitrogen, 23 bushels. Some samples of this type are acid. Lime in connection with legume rotation would improve the physical character of the soil. Legume rotation on the State Experiment farm has considerably increased the yields, especially of corn. Legume rotation is the first need of this soil.

Lufkin gravelly fine sandy loam—The surface material is a grayish-brown or grayish, loamy fine sand, about 6 to 20 inches deep, containing sufficient gravel to impart a friable, open structure. The subsoil is a drab, sticky, plastic clay, generally showing some yellowish and in places reddish mottling directly beneath the sandy surface material.

The acreage of this gravelly soil is small, and it is not widely distributed. It occurs on high ridges or knolls and well-drained slopes. The gravelly fine sandy loam is more droughty than the fine sandy loam, and has a somewhat lower agricultural value. Cotton and corn are practically the only crops grown.

The soil is low in nitrogen and phosphoric acid. It needs a legume rotation, phosphoric acid, nitrogen, and vegetable matter.

Miller clay—This is the most important type of the Miller series both in extent and in agricultural value. The surface soil is generally a chocolate-red silty clay becoming redder in color at about 12 to 15 inches.

The subsoil is a fine-grained, compact, plastic clay, which in many places extends with little or no change in color or texture to a depth of 12 to 15 feet, and in several places the whole mass of the alluvial deposit, 35 to 40 feet in thickness, is composed of dark chocolate red clay apparently not different from that of the surface 3 feet.

This is the Brazos bottom land. All of the type may be cultivated. Much of it is sufficiently well drained naturally, and the remainder can be artificially drained at no great expense. All of the land was originally forested, but probably 90 per cent. of it has been cleared.

The soil is sticky and tenacious when wet and rather difficult to cultivate. However, it assumes a crumbly structure upon drying, and owing to this characteristic is commonly referred to as "buckshot land." The texture and structure, with proper cultivation, are favorable to the retention of moisture.

The Miller clay produces higher average yields of cotton and corn than any of the other soil types of the county. On many farms the better drained land produces average yields of three-fourths bale of cotton per acre and 40 bushels of corn. Exceptional yields of 1 bale of cotton and 60 bushels of corn per acre occasionally are obtained. Alfalfa is grown in small fields and gives fair results. Sorghum and oats for forage are grown in small patches.

The soil is well supplied with plant food.

Miller fine sand—This type is of small extent and of small agricultural value in this county. It occurs on the immediate banks and within the narrow bends or loops of the river. The material consists of a grayish-brown or light reddish-brown, loose, friable fine sand, changing but little in color and texture with depth, the lower soil material possibly containing a little more silt and clay, which gives it a slightly loamy feel.

The soil is not naturally well adapted to corn and cotton. Some of it possibly could be utilized for truck crops. Bermuda grass prevents the shifting of the soil and affords good pasturage on land otherwise poorly suited to cotton or general farming.

The sample examined is high in phosphoric acid but low in nitrogen and potash. This sample is unusual in character, and other samples should be examined.

Miller fine sandy loam—This is a light brown to reddish-brown, rather loose fine sandy loam, underlain by chocolate-red or salmon-red clay. This type is a rather variable bottom land. A considerable part is forested.

The soil is much more friable and pervious than the clay type, and is more easily cultivated, except where the surface is uneven and hummocky. The average crop yields, however, are lower than on the clay. The yield of cotton is about one-third bale per acre. Corn gives good results in seasons of well distributed rainfall, but is more subject to injury by drought than on the heavier types. Sorghum and oats can be grown successfully. Johnson grass does well. The soil is suited to melons and truck crops.

This soil is not high in nitrogen. A legume rotation is needed. Fertilizers containing phosphoric acid and nitrogen should give good results on truck crops.

Norfolk fine sand—This consists of a grayish to grayish-brown loose fine sand, varying but little in texture and structure within the 3-foot section. The depth to which the sand contains any appreciable quantity of organic matter is about 10 inches; below this the material is somewhat lighter in color.

The Norfolk fine sand occurs in small areas on the uplands, generally on the tops of hills or on stream divides. Most of the land is well drained. The separate areas do not exceed 300 to 400 acres in extent. The land is forested in post oak, with some blackjack, hickory, and elm.

The average yields of cotton and corn under present methods of cultivation are low, not more than one-fourth bale of cotton and 12 to 15 bushels of corn per acre being produced.

Legume rotations and fertilizers containing phosphoric acid and nitrogen are needed.

Ochlockonee clay—This is a dark brown to black, plastic or heavy plastic silty clay loam about 4 to 10 inches in depth, underlain by dark-drab to grayish, plastic, impervious clay.

The principal occurrence of the Ochlockonee clay is along the lower courses of Cedar and Wickson Creeks, where in places the bottoms are one-half to three-fourths mile wide. The land lies 8 to 12 feet above the normal water level, but is subject to frequent overflows and is rather poorly drained, and for these reasons only a small part of the type has been placed under cultivation. The type is forested.

The soil is sticky and tenacious when wet and very hard and difficult to break when dry. It is, however, a strong durable soil and produces good yields of corn and cotton when weather conditions are favorable for properly preparing the land.

It is well supplied with plant food.

Ochlockonee fine sandy loam—This generally consists of a light-brown loamy fine sand, 10 to 30 inches in depth, underlain by grayish or grayish-brown, sticky, fine sandy loam to fine sandy clay. The alluvial soils along the creeks are variable in texture, but the textural differences are unimportant.

In general, the fine sandy loam and fine sand soils occur along the upper courses of the creeks, and are developed along the small streams. They are subject to frequent overflows, and crops are often seriously damaged. The water, however, does not stand in the bottoms for any considerable length of time. The bottoms are forested.

A large proportion of the Ochlockonee fine sandy loam has been placed under cultivation, and the soil has proved more productive than the contiguous upland sandy soils.

The average yield of cotton in favorable years is about one-half bale, and that of corn about 30 bushels per acre. The type is well suited to sorghum, and Johnson grass and Bermuda grass should prove profitable as hay crops.

The soil is fairly well supplied with plant food and will need legume rotation first.

Ochlockonee silt loam—This consists of a dark grayish-brown to nearly black, slightly plastic silt loam, underlain at about 12 to 20 inches by grayish or light yellowish-brown, plastic silty clay loam. The substratum to a depth of about 6 to 10 feet is composed of fine sandy clay.

The Ochlockonee silt loam occurs principally along the middle or lower courses of the creeks.

The soil is naturally productive and gives good yields of cotton and corn. The land is subject to frequent overflows. Much of it can be improved by ditching. It is well supplied with plant food.

Susquehanna clay—The surface material consists of a tough, compact clay usually covered with an inch or two of brownish fine sandy loam or silt loam. The clay at about 6 to 8 inches becomes brighter red in color, and usually shows mottlings of grayish or drab in the lower subsoil.

This type occurs in small, widely separated areas, in association with the Crockett soils along the San Antonio road. It occupies eroded knolls and appears on slopes along the valleys of small creeks.

The type supports a thick, but small and scrubby growth of post oak and blackjack oak. The land is of little value for cultivated crops, being extremely difficult to break to any considerable depth, and becoming quite hard and compact in dry periods. The few areas in cultivation do not produce average yields of more than one-fourth bale of cotton and 12 to 15 bushels of corn.

The soil is low in phosphoric acid, and is acid. Additions of lime would probably improve the character of the soil.

Susquehanna fine sandy loam—This consists of a grayish-brown to faint reddish-brown fine sandy loam or loamy fine sand, underlain at 6 to 24 inches by a red and drab mottled, stiff, plastic, clay. The surface sandy layers show considerable variations in thickness. The subsoil is generally mottled red and drab, although there are a number of minor variations.

The Susquehanna fine sandy loam is distributed throughout the county, but the largest areas occur in the northern part in a belt 4 to 8 miles wide extending from near Smetana northeastward to Edge and the Navasota river bottom. In the central and southern parts of the county it occurs in widely separated areas, mainly of small size, occupying high knolls or ridges. All the land is well drained and easily cultivated. The type is utilized principally for the production of cotton and corn. The average yields are about one-third of a bale cotton and 15 bushels of corn per acre. Oats do fairly well, but, as on the other sandy types, are subject to rust, and the yields are frequently low. Cowpeas and sorghum are grown to a small extent. Peanuts and sweet potatoes do well on the areas of deeper soil.

The corn possibility of the phosphoric acid is 12 bushels per acre. The soil needs phosphoric acid and legume rotation.

Susquehanna gravelly fine sandy loam—The soil consists of 12 to 15 inches of fine sandy material containing a variable quantity of gravel, generally not more than 10 per cent. of the soil mass. The subsoil is red or mottled red and drab clay.

This type covers only a small area and is of relatively little agricultural importance in the county. The principal areas lie along the Sandy Point road 6 to 8 miles northwest of Bryan. The land supports a forest growth in which post oak predominates. Cotton and corn are practically the only crops grown. The yields are low.

The sample examined is low in phosphoric acid and in total nitrogen.

Tabor fine sandy loam—This consists of a grayish-brown fine sandy loam, underlain at about 15 to 30 inches by dull-yellowish, plastic, impervious clay, which generally becomes greenish-yellow in the lower part of the 3-foot section. Often there is a stratum of yellowish fine sandy loam or fine sandy clay over the plastic yellow clay subsoil. There is generally a wet or saturated layer of light-gray, sticky fine sandy loam or clay, 2 to 4 inches in thickness, between the surface sand and the heavy, impervious underlying clay.

The largest areas of the Tabor fine sandy loam lie in the northern part of the county in the vicinity of Tabor and Edge.

The Tabor fine sandy loam is developed on stream divides and well-drained slopes. The topography is level to gently rolling. All the land is sufficiently well drained for cultivation, and there is no excessive drainage or serious erosion of slopes.

Average yields of about one-third bale of cotton and 15 to 18 bushels of corn per acre are obtained on this type. Peanuts and sweet potatoes do well, especially in the deeper sandy areas. Fruit on this type probably does as well as or better than on any other upland soil, except the Susquehanna fine sandy loam. The land is easily broken and tilled and by the addition of manures is capable of being made highly productive. The corn possibility of the phosphoric acid and nitrogen is 18 bushels per acre. The soil needs legume rotation and fertilizers.

Trinity clay—This consists of about 4 to 10 inches of black, plastic clay, underlain by dark-drab, plastic, impervious clay. The soil has a tendency to become very hard and compact when dry, and is sticky when wet.

The Trinity clay, with the exception of one small area along the Little Brazos river in the western part of the county, is confined to the bottom land along the Navasota river. The bottom lies about 15 feet above the normal stage of the river, and is subject to frequent overflows. Since this land, with the exception of a few isolated fields on the outer edge of the bottoms, is very poorly drained and wholly unprotected from floods, no attempt has been made to place it under cultivation, and though the soils are frequently productive, they are utilized only for pasture. The samples examined are lower in phosphoric acid than one would expect from bottom lands of this character.

Trinity fine sandy loam—This includes all of the sandy soils of the Navasota river bottom which have a black or dark-brown surface color and grayish, drab, or in places, black subsoils. The type consists mainly of a fine sandy loam 10 to 20 inches deep, underlain by drab or black, plastic clay. The area is small.

In two or three places where land has been placed under cultivation, good yields of corn and cotton have been obtained. The soil is well suited to sorghum. Bermuda grass should make good pasturage and might prove profitable as a hay crop. The sample examined is low in nitrogen.

Wilson clay—This consists of about 8 to 12 inches of dark-gray to black, sticky, plastic clay, underlain by a dark drab to black, plastic impervious clay which generally grades into a slate-colored, sticky, highly plastic clay at less than 3 feet. The soil material is probably more sticky and plastic than that of any other type in the county.

The total acreage is small, amounting to 1.9 square miles. The largest single area lies southeast of Millican, while smaller areas occur in the vicinity of Millican. The land is level and very gently rolling.

The soil is sticky and intractable when wet, and bakes upon drying. It is, however, strong and durable, and if plowed deep when the moisture content is favorable and then judiciously cultivated it will usually return yields of cotton and corn but little lower than those obtained on the Miller clay on the Brazos river bottoms. The incorporation of green manures is beneficial in improving the tilth. It is well supplied with plant food but will probably need legume rotation first.

Wilson clay loam—This consists of black very fine sandy loam or fine sandy loam underlain at about 2 to 5 inches by black or a dark-drab, sticky plastic clay. In many places the dark-colored plastic clay is encountered at about 2 feet, especially in the lower, flat situations. The soil becomes copact on drying.

The clay loam type occurs in irregular-shaped bodies throughout the uplands. One of the largest tracts is encountered west of Smetana on Clayton Prairie. Other areas of considerable size are mapped near Millican and at Rock Prairie.

The land for the most part is level prairie and very gently rolling. The type occurs on high, well-drained ridges northeast of Bryan. Near Smetana the land is very nearly level. Drainage is adequate for the staple crops of the county, and there is no destructive erosion or gullying.

All the land is cultivable. The soil, though somewhat later than the surrounding Lufkin types, is durable and fairly productive. In favorable years yields of one-half bale of cotton and 30 bushels of corn without the use of commercial fertilizers, are common. Such crops should succeed as Johnson grass for hay, sorghum, and kafir. Bur clover is well adapted to this type. The sample examined is well supplied with plant food. It will probably need legume rotation first.

Wilson fine sandy loam—This, when it occurs in shallow sags at the heads of drainage ways or small creeks, consists mainly of a dark grayish-brown to black fine sandy loam or very fine sandy loam about 12 to 15 inches deep, underlain by dark-drab or bluish-black, highly plastic, impervious clay. The subsoil generally grades into a drab or gray, plastic clay at less than 3 feet.

These areas produce fair yields of both cotton and corn, the yield of corn probably being higher than on the Lufkin fine sandy loam. Sorghum should do well. Much of the land could be improved by shallow tile drainage or by ditching.

In the prairie or gently rolling treeless areas the Wilson fine sandy loam is a friable, black or very dark grayish fine loam, underlain at depths of about 5 to 12 inches by a black, plastic silty clay which quickly changes into a drab, plastic clay, slightly mottled in places with yellow.

These areas of the Wilson fine sandy loam are well drained and easily cultivated. The average yields are about one-third bale of cotton or 15 to 20 bushels of corn per acre.

This soil will first need legume rotation, to supply nitrogen and humus. It will also probably need phosphoric acid.

Yahola clay loam—This alluvial soil consists generally of about 10 inches of light-chocolate or light brownish-red, slightly plastic silty clay loam, underlain by reddish, compact silt loam, or silty clay loam, the subsoil on the whole being lighter in texture than the surface soil.

The total acreage of this soil is small. It is a little more difficult to till than the Yahola silt loam. It does not harden or crack to such an extent as the Miller clay, and is a little better drained than that type. The strips of this soil are very narrow, and it is cultivated only in connection with other soils. This soil is well supplied with plant food, it will probably need nitrogen first.

Yahola silt loam—This is typically a light brownish-red or light reddish-brown, compact silt loam about 12 to 15 inches deep, commonly underlain by 4 to 10 inches of a light brownish-red, compact silt loam, and this in turn by salmon-red very fine sandy loam. The substratum consists of interbedded silt and loamy fine sand. The surface soil is slightly plastic when wet, and tends to clod and crust slightly when subjected to rapid drying.

The type is bottom land, located at slightly higher elevations than the Miller clay, and is naturally better drained. In the upper bottoms it occupies a very low ridge, 10 to 15 feet above the clay soils on each side and from one-half to a little more than one mile in width, lying between the Little Brazos and Brazos rivers.

The silt loam originally was forested, but practically all the type is under cultivation. It is much more easily cultivated than the Miller clay, and crops can be planted a few days earlier and start growing more rapidly in the spring.

The average yield of cotton is about one-half bale per acre, and of corn 30 to 35 bushels. Alfalfa gives good results. A great variety of crops can be grown successfully. The samples examined are well supplied with plant food. It will need legume rotation first.

SOILS OF CAMP COUNTY

Camp county is situated in the northeastern part of Texas, in the East Texas timber belt, about 40 miles west of the eastern boundary, and 50 miles south of the northern boundary. The elevation is 200 to 500 feet above sea level. The surface for the most part is gently rolling. Cotton is the chief crop, but corn, Irish potatoes, tomatoes, peaches, sweet potatoes, and other truck crops are also grown. Legume crops are being grown to some extent.

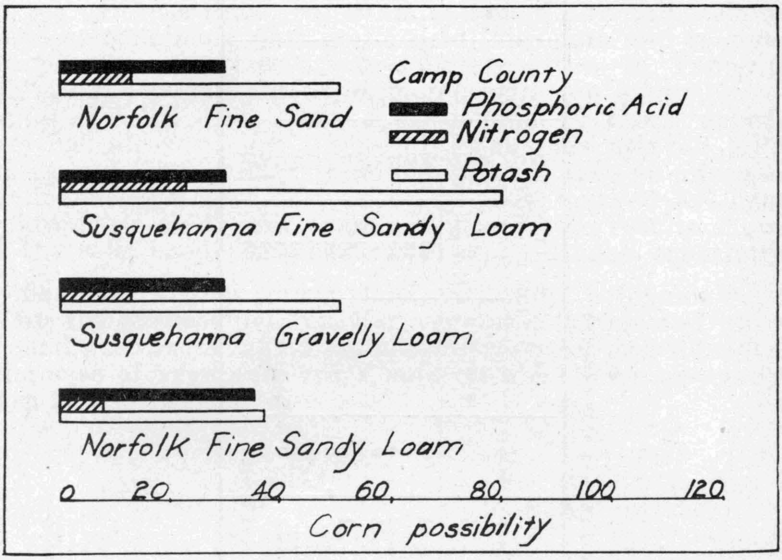

Figure 4—Corn possibility in bushels per acre of the active phosphoric acid, total nitrogen, and active potash of some soil types of Camp County.

Six types of soil belonging to four series have been mapped in this county. The Norfolk fine sandy loam occupies 47 per cent. of the area and the Susquehanna fine sandy loam 18 per cent. These are the most important agricultural soils in extent. Table 2 shows the average composition of the soils of this county. Table 8 contains the interpretation of

TABLE 8—INTERPRETATION OF ANALYSES—CAMP COUNTY.

Laboratory Number		Phosphoric Acid	Potash	Lime	Acidity	CORN POSSIBILITY TWO MILLION POUNDS			Acres	Percent of area
						Active phosphoric acid	Total Nitrogen	Active Potash		
12590	Caddo fine sandy loam—surface	good		good	0	18	23	80	384	0.3
12591	Caddo fine sandy loam—subsoil	low		fair	0	6	13	37		
12594	Norfolk fine sand—surface	good	low	good	0	40	13	37	4,864	3.7
12595	Norfolk fine sand—subsoil	low	low	good	0	35	8	37		
12592	Norfolk fine sandy loam—surface	fair	fair	fair	0	18	13	80	61,184	47.1
12593	Norfolk fine sandy loam—subsoil	low	low	good	0	6	13	37		
12586-12596	Susquehanna fine sandy loam—surface	fair	low	fair	0	30	23	80	23,360	18.0
12587-12597	Susquehanna fine sandy loam—subsoil	fair	fair	fair	—	6	48	51		
12598	Susquehanna gravelly loam—surface	fair	low	fair	0	30	13	51	19,328	14.9
12599	Susquehanna gravelly loam—subsoil	low		good	0	18	13	37		
12588	Susquehanna stony loam—surface	low	fair	low	0	35	23	120	1,024	0.8
12589	Susquehanna stony loam—subsoil	good		good	1100	12	23	80		
	Meadow	—	—	—	—	—	—	—	19,776	15.2

analyses of these soils. An examination of this table shows that these soils need phosphoric acid, nitrogen, and in some cases potash. Analyses of the soils are given in Table 9. Table 10 shows the pot experiments made on a number of samples of soils. The method of conducting these experiments has already been discussed. The pots marked KPN have a complete fertilizer, those marked KP have no nitrogen, those marked PN have no potash and those marked KN have no phosphoric acid. An examination of these results shows that the soils need phosphoric acid and nitrogen especially.

The soils of this county need, generally, a legume rotation for the purpose of supplying vegetable matter and nitrogen, and fertilizers including phosphoric acid and nitrogen. In the case of vegetable crops, and on some soils especially, potash is also needed.

TABLE 9.—CHEMICAL COMPOSITION, SOILS OF CAMP COUNTY.

Laboratory Number		Phosphoric Acid: Total Percent	Phosphoric Acid: Active Per Million	Nitrogen Percent	Potash: Total Percent	Potash: Acid Soluble Percent	Potash: Active Per Million	Lime Acid Soluble Percent	Magnesia Acid Soluble Percent	Basicity Percent	Acidity Per Million
12590	Caddo fine sandy loam—surface	.032	23.1	.069	.70	—	166.2	.27	.16	.45	0
12591	Caddo fine sandy loam—subsoil	.027	10.0	.030	.68	—	88.7	.18	.17	.35	0
12594	Norfolk fine sand—surface	.032	84.0	.022	.46	.05	77.0	.13	.05	.28	0
12595	Norfolk fine sand—subsoil	.029	71.9	.019	.58	.04	72.5	.13	.08	.22	0
12592	Norfolk fine sandy loam—surface	.035	26.2	.040	.55	.12	161.0	.11	.11	.25	0
12593	Norfolk fine sandy loam—subsoil	.022	8.1	.030	.64	.04	86.2	.33	.09	.23	0
12586	Susquehanna fine sandy loam—surface	.048	42.5	.062	.95	.09	192.5	.13	.13	.25	0
12596	Susquehanna fine sandy loam—surface	.045	48.7	.090	.68	.07	183.7	.20	.09	.29	0
	AVERAGE	.047	45.6	.076	.82	.08	188.1	.17	.11	.27	0
12587	Susquehanna fine sandy loam—subsoil	.071	8.7	.480	1.18	.21	160.0	.22	1.47	.19	1100
12597	Susquehanna fine sandy loam—subsoil	.036	2.5	.037	.79	.06	121.2	.15	.06	1.69	0
	AVERAGE	.054	5.6	.259	.99	.14	140.6	.19	.77	.94	—
12598	Susquehanna gravelly loam—surface	.033	54.4	.036	.39	.02	108.1	.15	0.09	.50	0
12599	Susquehanna gravelly loam—subsoil	.023	23.8	.024	.47	—	83.0	.22	.11	1.88	0
12588	Susquehanna stony loam—surface	.049	75.6	.065	.70	.11	281.2	.07	.19	.20	0
12589	Susquehanna stony loam—subsoil	.038	15.0	.061	.85	—	171.2	.40	.23	.20	1100

The use of lime on these sandy soils is not to be recommended, except possibly in connection with some legumes which will not grow without it. The use of lime on this land is likely to increase the loss of plant food, and result in making these lands poorer than they were before, especially if no proper legume rotation has been adopted.

Nitrogen is so expensive that it is not profitable to purchase large quantities of it; so most of the nitrogen should be secured by growing legumes. Potash is needed in some of the sandy soils of the area, especially for vegetables and truck, but phosphoric acid is needed more than potash. Fertilizers and a proper legume rotation can increase and maintain the fertility of these soils, but fertilizers alone, or legume rotation alone, would not be sufficient.

The soils of this county respond well to fertilizers, other conditions usually being favorable to good crop production. Fertilizers are used, are needed, and in connection with a proper legume rotation especially, should prove profitable, when fair prices are secured for farm products.

TABLE 10—POT EXPERIMENTS SOILS, CAMP COUNTY.

		Weight Crops in Grams				Corn Possibility of Plant Food Withdrawn		
		Complete Fertilizer	No Phosphoric Acid	No Nitrogen	No Potash	Phosphoric Acid	Nitrogen	Potash
12590	Caddo fine sandy loam—surface—corn —1917	36.4	19.9	10.8	31.7	26	15	176
12590	Caddo fine sandy loam—surface—sorghum —1917	26.0	17.2	11.1	20.6	19	16	86
12590	Caddo fine sandy loam—surface—corn —1918	45.6	19.5	6.4	29.1	26	9	60
12590	Caddo fine sandy loam—surface—sorghum —1918	33.3	15.3	6.6	19.2	11	2	28
	AVERAGE	35.3	18.0	8.7	25.2	20	11	88
12591	Caddo fine sandy loam—subsoil—corn —1917	35.7	8.5	8.5	32.7	12	10	115
12591	Caddo fine sandy loam—subsoil—sorghum —1917	19.7	1.7	3.7	5.2	7	6	31
12591	Caddo fine sandy loam—subsoil—corn —1918	41.4	10.2	4.0	37.1	17	10	34
12591	Caddo fine sandy loam—subsoil—sorghum —1918	18.5	4.2	3.8	10.6	6	5	78
	AVERAGE	28.8	6.2	5.0	21.4	9	7	64
12594	Norfolk fine sand—surface—corn —1917	34.3	25.0	7.8	30.4	37	10	74
12594	Norfolk fine sand—surface—sorghum —1917	14.2	13.7	2.6	15.9	21	5	52
12594	Norfolk fine sand—surface—corn —1918	39.6	25.2	3.9	22.7	29	6	63
12594	Norfolk fine sand—surface—sorghum —1918	15.7	10.2	4.7	10.9	11	7	14
	AVERAGE	26.0	18.5	4.8	20.0	25	7	51
12595	Norfolk fine sand—subsoil—corn —1917	20.2	23.6	10.0	23.1	34	10	80
12595	Norfolk fine sand—subsoil—sorghum —1917	24.2	21.6	2.6	20.1	30	4	53
12595	Norfolk fine sand—subsoil—corn —1918	33.3	21.3	4.8	11.5	22	7	52
12595	Norfolk fine sand—subsoil—sorghum —1918	14.7	4.4	4.0	9.5	4	6	17
	AVERAGE	23.1	17.7	5.4	16.1	23	7	50
12592	Norfolk fine sandy loam—surface—corn —1917	32.1	13.0	8.8	32.0	19	13	203
12992	Norfolk fine sandy loam—surface—sorghum —1917	13.4	2.5	9.7	4.3	6	12	46
12592	Norfolk fine sandy loam—surface—corn —1918	36.7	16.4	5.0	18.7	20	13	50
12592	Norfolk fine sandy loam—surface—sorghum —1918	23.6	4.7	5.3	19.3	6	8	43
	AVERAGE	26.5	9.2	7.2	18.6	13	11	86
12593	Norfolk fine sandy loam—subsoil—corn —1917	32.0	5.5	7.6	33.7	8	10	154
12593	Norfolk fine sandy loam—subsoil—sorghum —1917	11.4	1.0	3.5	10.0	1	30	53

TABLE 10—POT EXPERIMENTS SOILS, CAMP COUNTY.—Continued.

		Weight Crops in Grams				Corn Possibility of Plant Food Withdrawn		
		Complete Fertilizer	No Phosphoric Acid	No Nitrogen	No Potash	Phosphoric Acid	Nitrogen	Potash
12593	Norfolk fine sandy loam—subsoil—corn —1918	40.7	14.2	5.2	33.7	16	6	62
12593	Norfolk fine sandy loam—subsoil—sorghum —1918	11.9	0.4	4.1	12.0	4	5	27
	AVERAGE	24.0	5.2	5.1	22.4	7	13	74
12586	Susquehanna fine sandy loam—surface—corn —1917	35.3	22.7	13.1	33.1	40	20	181
12586	Susquehanna fine sandy loam—surface—sorghum —1917	12.5	14.7	12.7	12.2	3	24	66
12586	Susquehanna fine sandy loam—surface—corn —1918	48.5	33.5	9.0	38.1	3	12	72
12586	Susquehanna fine sandy loam—surface—sorghum —1918	23.1	15.3	10.9	17.8	2	10	28
	AVERAGE	29.9	21.6	11.4	25.3	12	16	87
12587	Susquehanna fine sandy loam—subsoil—corn —1917	28.0	5.9	10.0	24.7	11	68	155
12587	Susquehanna fine sandy loam—subsoil—sorghum —1917	10.0	0.1	1.9	12.6	0	4	44
12587	Susquehanna fine sandy loam—subsoil—corn —1918	38.4	8.8	3.1	29.9	14	6	75
12587	Susquehanna fine sandy loam—subsoil—sorghum —1918	13.3	0.5	1.5	11.8	1	3	22
	AVERAGE	22.4	3.8	4.1	19.8	6	21	74
12596	Susquehanna fine sandy loam—surface—corn —1917	40.2	23.1	17.9	39.1	39	25	221
12596	Susquehanna fine sandy loam—surface—sorghum —1917	18.1	7.2	13.3	18.5	11	44	90
12596	Susquehanna fine sandy loam—surface—corn —1918	39.0	26.5	10.2	34.1	37	18	78
12596	Susquehanna fine sandy loam—surface—sorghum —1918	23.1	18.0	13.0	19.3	16	23	35
	AVERAGE	30.1	18.7	13.6	27.8	26	28	106
12597	Susquehanna fine sandy loam—subsoil—corn —1917	33.3	3.0	12.5	30.8	6	16	168
12597	Susquehanna fine sandy loam—subsoil—sorghum —1917	15.3	2.4	10.4	10.8	3	12	59
12597	Susquehanna fine sandy loam—subsoil—corn —1918	30.3	10.0	18.0	22.6	14	6	39
12597	Susquehanna fine sandy loam—subsoil—sorghum —1918	13.8	1.0	2.1	9.7	2	3	23
	AVERAGE	23.2	4.1	10.8	18.5	6	9	72
12598	Susquehanna gravelly loam—surface—corn —1917	33.4	18.1	16.1	35.1	33	22	132
12598	Susquehanna gravelly loam—surface—sorghum —1917	18.4	7.7	8.5	20.2	14	14	52
12598	Susquehanna gravelly loam—surface—corn. —1918	29.3	18.0	7.2	17.6	26	12	45
12598	Susquehanna gravelly loam—surface—sorghum —1918	16.5	0.6	5.9	10.3	1	9	21
	AVERAGE	24.4	11.1	9.4	20.8	18	14	62

TABLE 10—POT EXPERIMENTS SOILS, COMP COUNTY.—Concluded

		Weight Crops in Grams				Corn Possibility of Plant Food Withdrawn		
		Complete Fertilizer	No Phosphoric Acid	No Nitrogen	No Potash	Phosphoric Acid	Nitrogen	Potash
12599	Susquehanna gravelly loam—subsoil—corn —1917	39.8	6.8	10.7	31.9	11	13	103
12599	Susquehanna gravelly loam—subsoil—sorghum —1917	12.3	0.7	2.4	10.4	1	5	44
12599	Susquehanna gravelly loam—subsoil—corn —1918	35.8	8.3	6.1	17.6	11	17	42
12599	Susquehanna gravelly loam—subsoil—sorghum —1918	18.3	0.7	3.5	5.2	1	6	16
	AVERAGE	26.6	4.1	5.7	16.3	6	11	51
12588	Susquehanna stony loam—surface—corn —1917	35.1	27.8	17.1	32.2	50	21	234
12588	Susquehanna stony loam—surface—sorghum —1917	24.3	21.6	11.1	26.2	39	18	134
12588	Susquehanna stony loam—surface—corn —1918	40.9	33.4	11.4	29.3	32	15	84
12588	Susquehanna stony loam—surface—sorghum —1918	25.0	26.0	8.3	23.1	21	12	67
	AVERAGE	31.4	27.2	12.0	27.7	35	16	130
12589	Susquehanna stony loam—subsoil—corn —1917	20.8	3.4	8.7	34.7	28	11	200
12589	Susquehanna stony loam—subsoil—sorghum —1917	17.3	0.2	4.1	18.3	0	6	87
12589	Susquehanna stony loam—subsoil—corn —1918	36.8	4.6	2.9	27.1	6	1	71
12589	Susquehanna stony loam—subsoil—sorghum —1918	18.0	0.7	2.1	10.7	1	4	20
	AVERAGE	23.2	2.2	4.5	22.7	7	6	94

DESCRIPTION OF SOIL TYPES OF CAMP COUNTY

Caddo fine sandy loam—The soil to a depth of 3 to 8 inches and occasionally 12 inches, is a very fine sand containing considerable clay and usually gray in color. The subsoil is a very tenacious impervious clay of varying color, being usually gray with a few mottles of yellow or red, though sometimes it is brown. Scattered over the surface and covering nearly one-half the type are small, rounded mounds of fine sand or fine loam 1 to 4 feet high and 2 to 4 rods wide.

The general topography of the soil is quite level. It occurs on poorly drained areas in the uplands some distance from the streams to a very limited extent, only a few small areas being mapped in the southwestern part of the county. These are locally known as "post oak flats."

The soil is quite refractory to handle, because of its large clay content and poorly drained condition. It is rather unproductive and is cold and backward in the spring. Water remains in depressions until evaporated. The great need of the soil is artificial drainage. When this is secured it should prove well suited to cotton and corn. In its natural condition it makes good pasturage. Cotton yields as high as one-half bale to the acre, and corn in favorable years 20 bushels per acre.

It is low in phosphoric acid and nitrogen and needs legume rotation.

Norfolk fine sand—The soil to a depth of 6 inches, is a gray medium or fine sand containing a small amount of organic matter in the surface when first brought under cultivation. It grades imperceptibly into the subsoil, which extends to a depth of 3 to 15 feet, a gray medium sand free from gravel.

The topography is level or gently rolling, often being deeply eroded. The Norfolk fine sand is not an extensive type and is confined to the southwestern part of the county. It is not highly esteemed for agricultural purposes, for it soon declines in productiveness, and does not withstand drought well. It is adapted especially to early truck crops, both fruit and vegetables doing well. Cotton yields one-fifth to one-half bale per acre, and corn 10 to 18 bushels. Peanuts do well.

It is low in nitrogen, needs a legume rotation, and should need nitrogen, phosphoric acid, and potash for truck crops. The sample examined is higher in active phosphoric acid than is usually the case with soils of this type.

Norfolk fine sandy loam—The surface 12 to 20 inches is a gray sandy loam. The subsoil to a depth of 3 to 10 feet, consists of a yellow sandy clay underlain by a stiff clay. The topography is usually level or gently rolling.

The original timber growth consisted of pines and hardwoods. When first cleared, the soil contains a good proportion of humus and is very productive. It is the leading farming soil of Camp County, and occurs in large bodies over the main uplands and along the upper courses of the small streams in the central and southern portions of the area. It is very easy to cultivate and the subsoil contains enough sand and silt to make it fairly pervious to water.

Cotton and corn are the principal crops. Cotton yields one-fourth bale to one bale per acre, averaging one-half bale. Corn yields 10 to 40 bushels per acre, averaging about 20 bushels. The greater part of the fruit and truck is grown on this soil. Peanuts, oats, cowpeas, and Bermuda grass all do well.

The sample examined is better supplied with active phosphoric acid than is usual with similar soils. It is very low in nitrogen. It needs a legume rotation and probably phosphate fertilizers. Potash would be needed for fruit and truck.

Susquehanna fine sandy loam—The surface to a depth of 6 to 12 inches is a gray fine sandy loam, containing a small amount of gravel made up of iron sandstone and iron concretions. The subsoil consists of a tenacious red plastic clay, containing but little sand or gravel, usually mottled with yellow and occasionally blue clay in the lower depths.

The topography is level to gently rolling. Where nearly level, the soil sometimes lacks good drainage because of its heavy subsoil. This type occurs along the smaller stream courses and on the low divides between them. The original forest growth consisted of hardwoods, with a small amount of pine. The structure of the soil is loose and porous and cultivation is easy. Green manuring is found very profitable and is to be advised.

This soil is adapted to a great variety of crops, such as cotton, corn, oats, cowpeas, and Bermuda grass. Cotton usually yields one-fourth to three-fourths bale per acre, averaging less than one-half bale. Corn produces 10 to 25 bushels per acre.

It is better supplied with plant food than the Norfolk soils, but is still low in nitrogen.

Susquehanna gravelly loam—The soil to a depth of 10 to 20 inches, consists of a reddish gray medium sandy loam, containing a large proportion of gravel made up of iron sandstone and iron concretions. The subsoil consists of a red clay, mottled with yellow or gray, and contains considerable gravel similar to that of the soil. This gravel content renders the clay pervious to water and coupled with the good surface slope gives the soil good drainage, but, on the other hand, the type does not withstand drought very well.

The topography is rolling, occurring along the bluffs of the larger streams where erosion has been rapid. It occurs mostly in the northern part of the county near Big Cypress Creek. The original timber growth consists mostly of hardwoods.

This is an early soil, adapted to all the staple crops of the county, especially truck and fruit. Cotton and corn are the principal crops. Cotton averages one-third bale per acre, but with good culture early varieties yield one bale to the acre. Corn yields 10 to 20 bushels per acre. Peaches seem to do well and many of the large peach orchards have been set out on this type.

The soil is low in nitrogen. It needs legume rotation and fruit and vegetables need a complete fertilizer.

Susquehanna stony loam—This is not uniform in character, but where typically developed it consists of a gray or reddish gray sandy loam, 6 to 12 inches deep, in which occurs a great number of stones of varying sizes. The subsoil differs from the soil in that it contains more clay, is often red in color, and frequently contains more rock fragments. The type is found in the rough, hilly section, locally know as the "mountains," in the southwestern part of the county.

The soil is not cultivated because of its stony character and rough topography. It is used for pasture or valued for the timber, consisting of shortleaf pine, blackjack, oak, hickory, and minor growths. It is low in nitrogen.

SOILS OF ELLIS COUNTY

Ellis county is situated in the northeastern part of Texas, in the black land belt. The elevation ranges from 450 to 750 feet above the sea level. The county is naturally divided into four agricultural sections, each being especially adapted to certain crops. The first division in the west is the valley land, which is well adapted to cotton and corn and in some portions to alfalfa. The next division is the white rock section, especially suited to wheat and oats. The third division is the black land belt, principally planted to cotton. The eastern part of the county is sandy land, and is best adapted to the growing of truck, fruit, and peanuts, but largely devoted to the production of cotton.

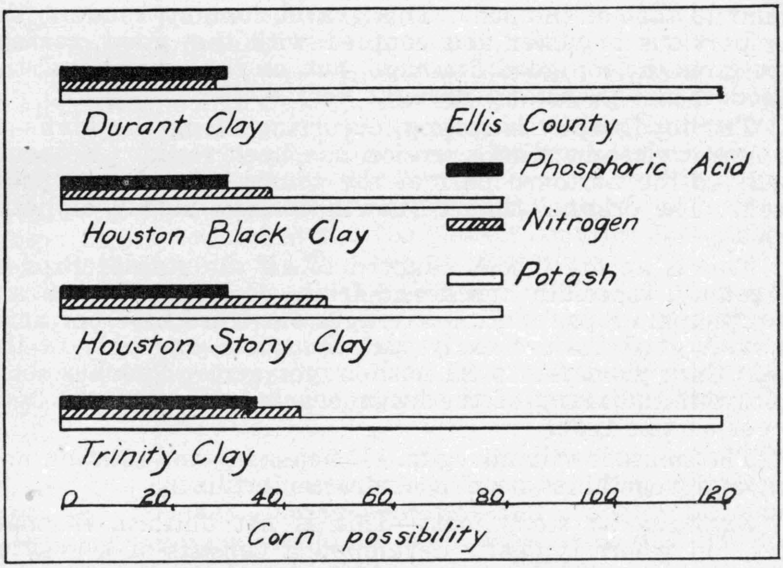

Figure 5—Corn possibility in bushels per acre of the active phosphoric acid, total nitrogen, and active potash of some soil types of Ellis County

Thirteen types of soil are found in the county, belonging to eight different series. The Houston black clay occupies 42.6 per cent. of the area, and this is a productive and durable soil. The Trinity clay occupies 15.0 per cent. of the area. This is a bottom land soil, very productive and durable. The Houston stony clay occupies 13.3 per cent. of the area, and the Durant clay occupies 6.8. Full descriptions of these types are given later.

The average chemical composition of the soils is shown in Table 2. The interpretation of the analyses is given in Table 11. Detailed analyses of the various types and their chemical composition are given in Table 12 and discussed in connection with the description of each type. The soils of this county are generally well supplied with plant food and with

TABLE 11.—INTERPRETATION OF ANALYSES, ELLIS COUNTY.

Laboratory Number		Phosphoric Acid	Potash	Lime	Acidity	Corn Possibility Two Million Lbs.			Acres	Per Cent of Area
						Active Phosphoric Acid	Total Nitrogen	Active Potash		
12572	Crawford clay loam—surface	good	good	good	0	50	48	207	8,448	1.4
12573	Crawford clay loam—subsoil	good	good	good	0	50	48	182	......	......
12574	Durant clay—surface	fair	good	fair	0	30	28	182	39,936	6.8
12575	Durant clay—subsoil	good	good	high	0	24	28	51	......	......
12576	Durant fine sandy loam—surface	good	good	good	0	24	28	80	17,280	2.9
12577	Durant fine sandy loam—subsoil	good	good	high	0	18	28	80	......	......
12584	Durant loam—surface	fair	good	fair	0	35	28	157	27,776	4.7
12585	Durant loam—subsoil	good	good	good	0	18	28	157	......	......
12531	Durant very fine sandy loam—surface	good	—	high	0	(74)	48	207	2,752	0.5
12532	Durant very fine sandy loam—subsoil	good	......	high	0	(74)	48	182	......	......
12582	Ellis clay—surface	good	good	high	0	45	43	120	18,880	3.2
12583	Ellis clay—subsoil	good	good	high	0	30	38	51	......	......
10954-12535-12566	Houston black clay—surface	good	good	high	0	30	38	80	250,176	42.6
10955-12536-12567	Houston black clay—subsoil	good	good	high	0	24	33	37	......	......
3418-12568	Houston clay—surface	good	good	high	0	40	38	80	15,244	2.1
3419-12569	Houston clay—subsoil	good	good	high	0	30	43	80	......	......
12570	Houston stony clay—surface	good	good	high	0	30	48	80	78,336	13.3
12571	Houston stony clay—subsoil	good	good	high	0	24	48	37	......	......
12578	Susquehanna fine sandy loam—surface	good	fair	good	0	45	18	120	5,632	1.0
12579	Susquehanna fine sandy loam—subsoil	good	good	fair	0	24	23	157	......	......
12564-12580	Trinity clay—surface	good	good	high	0	35	43	120	87,872	15.0
12565-12581	Trinity clay—subsoil	good	good	high	0	40	38	80	......	......
12533	Wilson clay loam—surface	good	......	high	0	40	48	157	37,500	6.4
12534	Wilson clay loam—subsoil	good	......	high	0	45	48	120	......	......

lime, and are better than the bottom lands of some of the other counties. Pot experiments are given in Table 13. The most important need of the soils of this county from the fertility standpoint is a proper rotation of crops including a legume to be turned under or grazed off. The Houston black clay, which occupies such a large area in the county, is very productive and durable, but no soil can be continually cropped with a cultivated crop without falling off in production. Such is the case with many of the farms on the Houston soils.

A proper legume rotation, including a legume to be turned under or grazed off, will supply nitrogen from the air, supply vegetable matter which aids in retaining water, improves the physical character of the soil, aiding in controlling plant diseases, and insect pests, and in other ways increase the productiveness of the soil. The soils of this and other counties will continue to decrease in fertility until a proper rotation has been established and continually followed. Many farmers object that the high value of the land does not permit such crops, but such a rotation is practiced on European lands still more expensive, and the alternative to proper legume rotation is soil exhaustion.

TABLE 12.—CHEMICAL COMPOSITION OF SOILS OF ELLIS COUNTY.

Laboratory Number		Phosphoric Acid: Total Percent	Phosphoric Acid: Active Per Million	Nitrogen Percent	Potash: Total Percent	Potash: Acid Soluble Percent	Potash: Active Per Million	Lime Acid Soluble Percent	Magnesia Acid Soluble Percent	Basicity Percent	Acidity per Million
12572	Crawford clay loam—surface	.186	360.0	.223	1.78	.84	855.0	.25	1.62	3.18	0
12573	Crawford clay loam—subsoil	.165	300.6	.180	1.70	.70	530.0	.48	3.05	3.88	0
12574	Durant clay—surface	.073	45.6	.100	1.07	.52	433.7	.27	0.85	2.98	0
12575	Durant clay—subsoil	.660	32.5	.082	.98	.41	141.2	3.21	1.60	2.57	0
12576	Durant fine sandy loam—surface	.060	36.2	.095	.70	.30	178.0	0.35	0.91	2.33	0
12577	Durant fine sandy loam—subsoil	.050	21.2	.089	.71	.32	181.2	1.07	0.45	1.83	0
12584	Durant loam—surface	.060	60.6	.087	.88	.39	386.2	.12	0.64	1.78	0
12585	Durant loam—subsoil	.065	28.7	.090	.87	.40	390.0	.23	0.88	1.78	0
12531	Durant very fine sandy loam—surface	.308	1081.2	.237	1.79	—	628.7	2.33	0.45	3.65	0
12532	Durant very fine sandy loam—subsoil	.301	1011.2	.182	1.76	—	567.5	3.85	0.66	5.88	0
12582	Ellis clay—surface	.129	104.2	.148	1.32	.56	275.0	2.67	2.69	9.30	0
12583	Ellis clay—subsoil	.108	44.4	.121	1.52	.65	126.2	6.69	0.92	9.70	0
10954	Houston black clay—surface	.083	16.2	.111	1.08	.72	116.2	9.47	1.14	10.00	0
12535	Houston black clay—surface	.124	61.2	.149	1.08	—	208.7	10.63	1.22	9.95	0
12566	Houston black clay—surface	.124	46.2	.138	—	.61	168.7	10.31	.62	10.00	0
	Average	.110	41.2	.133	1.08	.67	164.5	10.14	.99	9.98	0
10955	Houston black clay—subsoil	.067	13.7	.076	1.04	0.70	48.7	10.72	.99	10.00	0
12536	Houston black clay—subsoil	.116	58.1	.120	.97	—	125.0	10.64	1.16	10.00	0
12567	Houston black clay—subsoil	.072	41.4	.110	1.05	—	104.3	—	—	10.00	0
	Average	.085	37.7	.102	1.02	0.70	92.7	10.68	1.08	10.00	0
3418	Houston clay—surface	.022	18.2	.070	.95	.33	81.2	.25	.25	.35	0
12568	Houston clay—surface	.121	150.0	.184	1.24	.71	270.8	2.95	2.27	7.32	0
	Average	.072	84.1	.127	1.10	.52	175.5	1.60	1.26	3.84	0
3419	Houston clay—subsoil	.052	11.2	.054	1.01	.28	87.0	.25	.26	.45	0
12569	Houston clay—subsoil	.110	100.0	.265	1.32	.67	265.0	1.27	2.31	6.12	0
	Average	.081	55.6	.160	1.17	.48	176.0	.76	1.29	3.29	0
12570	Houston stony clay—surface	.181	42.5	.350	1.14	.49	200.0	4.31	4.91	10.00	0
12571	Houston stony clay—subsoil	.178	31.2	.346	1.11	.53	100.0	.55	4.01	10.00	0
12578	Susquehanna fine sandy loam—surface	.099	120.0	.054	.39	.15	221.2	.26	0.34	.69	0
12579	Susquehanna fine sandy loam—subsoil	.105	39.4	.076	.52	.25	317.5	.16	.31	.74	0
12564	Trinity clay—surface	.122	71.9	.150	—	.57	241.2	—	—	10.00	0
12580	Trinity clay—surface	.124	59.4	.153	1.34	.50	247.5	7.08	0.70	9.85	0
	Average	.123	65.7	.152	1.34	.54	244.4	7.08	0.70	9.93	0

TABLE 12.—CHEMICAL COMPOSITION OF SOILS OF ELLIS COUNTY.—Concluded.

Laboratory Number		Phosphoric Acid Total Percent	Phosphoric Acid Active Per Million	Nitrogen Percent	Potash Total Percent	Potash Acid Soluble Percent	Potash Active Per Million	Lime Acid Soluble Percent	Magnesia Acid Soluble Percent	Basicity Percent	Acidity per Million
12565	Trinity clay—subsoil	.122	98.7	.123	—	.51	137.5	—	—	9.95	0
12581	Trinity clay—subsoil	.118	80.6	.131	1.24	.45	182.5	3.12	3.29	9.95	0
	AVERAGE	.120	89.7	.127	1.24	.48	160.0	3.12	3.29	9.95	0
12533	Wilson clay loam—surface	.123	84.4	.163	1.39	—	311.2	8.63	1.12	9.95	0
12534	Wilson clay loam—subsoil	.130	101.9	.164	1.37	—	237.5	9.13	1.12	9.95	0

DESCRIPTION OF SOILS OF ELLIS COUNTY

Crawford clay loam—This consists of a chocolate-brown silty clay loam, to a depth of 8 inches, underlain to a depth of 3 feet by a light-brown chocolate, or reddish-brown silty clay. The principal difference between the soil and subsoil is the color. This is a very uniform type, the main variation being in the depth to the underlying limestone, which is very seldom more than 4 feet from the surface and it is generally found at a depth of about 25 to 35 inches.

The type is confined entirely to the eastern part of the county. The entire type covers comparatively small areas. The largest area is found at Midlothian, extending north and south through the eastern part of the town, and is about 3 miles in length and varies from about one-fourth mile to one and three-fourths miles in width. Other important areas are found along Gratehouse Branch and Mill and Red Oak Creeks.

TABLE 13.—POT EXPERIMENTS ON SOILS OF ELLIS COUNTY.

		Weight Crops in Grams				Corn Possibility of Plant Food Withdrawn		
		Complete Fertilizer	No Phosphoric Acid	No Nitrogen	No Potash	Phosphoric Acid	Nitrogen	Potash
12572	Crawford loam—surface—corn —1917	43.3	42.6	30.2	39.3	87	46	834
12572	Crawford loam—surface—sorghum—1917	29.7	33.5	20.3	29.6	62	30	263
12572	Crawford loam—surface—corn —1918	54.8	52.8	14.1	57.1	67	36	443
12572	Crawford loam—surface—sorghum—1918	36.6	32.1	27.4	32.7	27	36	213
	AVERAGE	41.1	40.2	23.0	39.7	61	37	439
12573	Crawford loam—subsoil—corn —1917	40.9	34.6	24.6	43.0	59	33	556
12573	Crawford loam—subsoil—sorghum—1917	30.4	28.3	11.6	28.5	43	15	210
12573	Crawford loam—subsoil—corn —1918	45.7	43.4	10.0	49.5	47	13	265
12573	Crawford loam—subsoil—sorghum—1918	36.7	35.5	16.1	31.3	36	19	155
	AVERAGE	38.4	35.5	15.6	38.1	46	20	297
12574	Durant clay—surface—corn —1917	29.5	23.6	15.0	33.5	43	24	564
12574	Durant clay—surface—sorghum—1917	28.5	30.0	11.5	40.7	44	17	257
12574	Durant clay—surface—corn —1918	48.1	40.2	20.1	44.0	41	24	202
12574	Durant clay—surface—sorghum—1918	49.4	39.6	8.0	38.5	30	10	129
	AVERAGE	38.9	33.4	13.7	39.2	39	19	288
12575	Durant clay—subsoil—corn —1917	25.7	12.8	16.2	27.5	20	26	316
12575	Durant clay—subsoil—sorghum—1917	23.9	18.5	5.1	21.5	22	7	143
12575	Durant clay—subsoil—corn —1918	46.4	20.1	6.3	42.6	24	9	210
12575	Durant clay—subsoil—sorghum—1918	39.8	14.6	6.3	37.2	12	9	159
	AVERAGE	34.0	16.5	8.5	32.2	17	13	107
12576	Durant fine sandy loam—surface—corn —1917	14.1	13.4	12.7	28.9	23	13	145
12576	Durant fine sandy loam—surface—sorghum—1917	23.1	11.3	8.3	21.5	17	12	119
12576	Durant fine sandy loam—surface—corn —1918	43.0	18.6	8.9	42.9	20	11	163
12576	Durant fine sandy loam—surface—sorghum—1918	31.2	14.3	8.7	20.5	11	11	73
	AVERAGE	27.9	14.4	9.7	28.5	18	12	125
12577	Durant fine sandy loam—subsoil—corn —1917	22.6	6.0	13.2	29.0	9	19	113
12577	Durant fine sandy loam—subsoil—sorghum—1917	19.3	4.4	5.5	20.9	5	8	103

TABLE 13.—POT EXPERIMENTS ON SOILS OF ELLIS COUNTY.—Continued.

		Weight Crops in Grams				Corn Possibility of Plant Food Withdrawn		
		Complete Fertilizer	No Phosphoric Acid	No Nitrogen	No Potash	Phosphoric Acid	Nitrogen	Potash
12577	Durant fine sandy loam—subsoil—corn —1918	42.6	10.3	6.5	34.7	10	8	109
12577	Durant fine sandy loam—subsoil—sorghum —1918	31.2	14.5	6.0	25.5	12	8	89
	Average	28.9	8.8	7.8	27.5	9	11	103
12584	Durant loam—surface—corn —1917	33.2	28.7	10.9	29.1	57	16	431
12584	Durant loam—surface—sorghum—1917	29.8	29.6	10.3	28.0	52	16	250
12584	Durant loam—surface—corn —1918	46.5	44.7	8.5	46.5	43	15	202
12584	Durant loam—surface—sorghum—1918	38.4	35.3	11.1	41.7	34	12	105
	Average	37.0	34.6	10.2	36.3	46	15	247
12585	Durant loam—subsoil—corn —1917	29.7	16.5	12.7	33.7	21	19	349
12585	Durant loam—subsoil—sorghum—1917	28.1	24.3	7.3	27.2	36	12	186
12585	Durant loam—subsoil—corn —1918	24.3	28.9	7.2	39.2	24	8	146
12585	Durant loam—subsoil—sorghum—1918	42.1	22.2	6.8	33.5	19	9	119
	Average	31.1	23.0	8.5	33.4	25	12	200
12531	Durant very fine sandy loam—surface—corn —1917	31.3	47.5	—	46.8	70	—	982
12531	Durant very fine sandy loam—surface—sorghum—1917	27.2	29.6	—	34.9	99	—	350
12531	Durant very fine sandy loam—surface—corn —1918	46.3	50.2	—	46.5	45	—	264
12531	Durant very fine sandy loam—surface—sorghum—1918	37.2	31.1	—	38.6	28	—	165
	Average	35.5	39.6	—	41.7	60	—	440
12532	Durant very fine sandy loam—subsoil—corn —1917	40.3	—	42.0	—	—	90	—
12532	Durant very fine sandy loam—subsoil—sorghum—1917	32.0	—	10.0	—	—	27	—
12532	Durant very fine sandy loam—subsoil—corn —1918	33.5	—	10.3	—	—	14	—
12532	Durant very fine sandy loam—subsoil—sorghum—1918	39.0	—	13.5	—	—	16	—
	Average	36.2	—	19.0	—	—	37	—
12582	Ellis clay—surface—corn —1917	27.9	24.6	15.3	28.6	48	284	60
12582	Ellis clay—surface—sorghum—1917	27.6	28.6	22.6	26.5	38	19	242
12582	Ellis clay—surface—corn —1918	47.2	40.8	15.7	46.3	42	19	268
12582	Ellis clay—surface—sorghum—1918	38.2	32.3	15.7	31.2	27	18	165
	Average	35.2	31.6	17.3	33.2	39	85	184

TABLE 13.—POT EXPERIMENTS ON SOILS OF ELLIS COUNTY.—Continued.

		Weight Crops in Grams				Corn Possibility of Plant Food Withdrawn		
		Complete Fertilizer	No Phosphoric Acid	No Nitrogen	No Potash	Phosphoric Acid	Nitrogen	Potash
12583	Ellis clay—subsoil—corn —1917	21.9	10.3	14.4	25.3	20	32	313
12583	Ellis clay—subsoil—sorghum—1917	23.0	12.3	6.7	22.5	19	10	173
12583	Ellis clay—surface—corn —1918	42.9	19.2	8.8	40.9	19	10	239
12583	Ellis clay—surface—sorghum—1918	38.5	23.4	10.2	32.0	16	10	91
	AVERAGE	31.6	16.3	10.0	30.2	18	15	204
12535	Houston black clay—surface—corn —1917	40.8	26.1	21.2	23.8	50	32	369
12535	Houston black clay—surface—sorghum—1917	33.0	27.6	8.5	29.4	44	13	290
12535	Houston black clay—surface—corn —1918	47.9	34.9	8.2	43.7	29	7	330
12535	Houston black clay—surface—sorghum—1918	46.6	28.1	12.3	43.6	27	15	202
	AVERAGE	42.1	29.2	12.8	35.1	37	17	298
12536	Houston black clay—subsoil—corn —1917	27.0	19.3	22.6	36.9	20	166	507
12536	Houston black clay—subsoil—sorghum—1917	28.0	21.5	5.2	27.2	16	8	173
12536	Houston black clay—subsoil—corn —1918	40.3	17.7	5.6	27.6	23	9	143
12536	Houston black clay—subsoil—sorghum—1918	38.0	13.8	6.7	37.1	13	9	139
	AVERAGE	33.3	18.1	10.0	32.2	18	48	241
12568	Houston clay—surface—corn —1917	39.5	36.4	19.1	38.9	63	26	498
12568	Houston clay—surface—sorghum —1917	29.9	24.7	8.7	27.5	270	13	179
12568	Houston clay—surface—corn —1918	44.6	39.2	9.0	40.5	45	13	206
12568	Houston clay—surface—sorghum —1918	32.8	28.7	12.7	31.6	29	14	135
	AVERAGE	36.7	32.2	12.4	34.6	102	17	271
12569	Houston clay—subsoil—corn —1917	28.7	17.9	18.0	28.0	26	26	316
12569	Houston clay—subsoil—sorghum —1917	17.8	10.8	7.0	25.0	12	10	132
12569	Houston clay—subsoil—corn —1918	54.2	24.8	9.8	45.2	21	12	184
12569	Houston clay—subsoil—sorghum —1918	39.1	18.7	9.0	30.4	13	10	89
	AVERAGE	35.0	18.1	11.0	32.2	18	14	180
12570	Houston stony clay—surface—corn —1917	20.1	30.1	31.5	31.1	58	72	521
12570	Houston stony clay—surface—sorghum —1917	32.5	27.6	17.5	35.3	43	25	214

TABLE 13.—POT EXPERIMENTS ON SOILS OF ELLIS COUNTY.—Continued.

		Weight Crops in Grams				Corn Possibility of Plant Food Withdrawn		
		Complete Fertilizer	No. Phosphoric Acid	No. Nitrogen	No. Potash	Phosphoric Acid	Nitrogen	Potash
12570	Houston stony clay—surface—corn —1918	60.5	43.0	26.2	50.3	48	34	197
12570	Houston stony clay—surface—sorghum —1918	39.2	33.0	21.4	32.0	26	29	118
	AVERAGE	38.1	33.4	24.2	37.2	44	40	263
12571	Houston stony clay—surface—corn —1917	34.9	19.0	29.1	26.0	30	91	284
12571	Houston stony clay—surface—sorghum —1917	26.7	19.9	17.6	28.3	27	28	134
12571	Houston stony clay—surface—corn —1918	51.2	22.5	14.2	49.6	22	23	145
12571	Houston stony clay—surface—sorghum —1918	29.7	19.5	26.5	35.6	15	28	108
	AVERAGE	35.6	20.2	21.9	34.9	23	43	168
12578	Susquehanna fine sandy loam—surface—corn —1917	33.2	30.2	10.3	30.7	50	14	226
12578	Susquehanna fine sandy loam—surface—sorghum —1917	24.4	20.7	4.6	21.2	43	7	90
12578	Susquehanna fine sandy loam—surface—corn —1918	40.9	42.4	9.2	40.5	43	93	118
12578	Susquehanna fine sandy loam—surface—sorghum —1918	29.1	20.4	5.9	24.3	16	8	65
	AVERAGE	31.9	28.5	7.5	29.2	38	31	125
12579	Susquehanna fine sandy loam—subsoil—corn —1917	29.7	28.5	15.2	32.5	35	21	187
12579	Susquehanna fine sandy loam—subsoil—sorghum —1917	22.8	19.0	2.8	21.3	26	4	74
12579	Susquehanna fine sandy loam—subsoil—corn —1918	44.2	34.2	8.5	39.8	41	10	103
12579	Susquehanna fine sandy loam—subsoil—sorghum —1918	31.8	23.1	5.1	23.1	20	6	47
	AVERAGE	32.1	26.2	7.9	29.2	32	10	103
12580	Trinity clay—surface—corn —1917	38.6	28.5	31.6	33.5	59	54	586
12580	Trinity clay—surface—sorghum —1917	30.0	28.3	11.3	28.6	46	16	281
12580	Trinity clay—surface—corn —1918	42.7	40.4	10.0	48.0	52	12	276
12580	Trinity clay—surface—sorghum —1918	38.0	30.2	11.7	37.4	32	15	118
	AVERAGE	37.3	31.9	16.2	36.9	45	74	315
12581	Trinity clay—subsoil—corn —1917	28.5	20.9	26.2	28.2	38	43	482
12581	Trinity clay—subsoil—sorghum —1917	29.1	28.5	7.0	23.6	39	10	241
12581	Trinity clay—subsoil—corn .. —1918	46.0	28.7	11.4	37.8	30	16	188
12581	Trinity clay—subsoil—sorghum —1918	38.0	30.3	11.7	37 4	24	13	160
	AVERAGE	35.4	27.1	14.1	31.8	33	20	268

TABLE 13.—POT EXPERIMENTS ON SOILS OF ELLIS COUNTY.—Concluded

		Weight Crops in Grams				Corn Possibility of Plant Food Withdrawn		
		Complete Fertilizer	No Phosphoric Acid	No Nitrogen	No Potash	Phosphoric Acid	Nitrogen	Potash
12533	Wilson clay loam—surface—corn —1917	30.3	28.5	19.8	33.6	73	35	52
12533	Wilson clay loam—surface—sorghum —1917	32.1	30.7	12.2	31.0	67	17	173
12533	Wilson clay loam—surface—corn —1918	46.3	42.8	4.4	83.4	41	13	204
12533	Wilson clay loam—surface—sorghum —1918	44.6	44.6	14.5	40.5	32	18	219
	Average	38.3	36.7	12.7	37.1	53	21	162
12534	Wilson clay loam—subsoil—corn —1917	33.5	26.5	22.6	33.0	52	36	640
12534	Wilson clay loam—subsoil—sorghum —1917	28.9	29.2	7.3	26.2	48	10	219
12534	Wilson clay loam—subsoil—corn —1918	42.5	42.5	4.4	41.8	43	8	274
12534	Wilson clay loam—subsoil—sorghum —1918	41.7	41.0	11.1	34.8	34	13	193
	Average	36.7	34.8	11.4	34.0	44	17	332

The topography of the type varies from rolling to hilly. On the tops of some of the hills are sometimes almost level areas. Owing to the topography, the soil has good surface drainage. When put in good condition it acts very much like a heavy loam, although it bakes slightly and is very sticky when wet. It does not crack like some of the clay soils or stick to the plows so badly. While only of limited extent, it is considered one of the most desirable soils in the area, partly on account of ease of cultivation and partly because of natural productiveness.

This soil is well adapted to cotton, corn, wheat, and oats, and is especially suited to small grain. Cotton yields one-third to three-fourths bale, corn 30 to 40 bushels, oats 40 to 60 bushels, and wheat 12 to 20 bushels per ace.

It is well supplied with plant food.

Durant Clay—The soil to a depth of 8 inches is a dark-brown to almost black clay, sometimes having a slightly grayish tinge. The subsoil from 8 to 36 inches is stiff, heavy, pale yellowish drab clay, sometimes having a dark bluish color. Scattered over the surface and throughout both soil and subsoil are lime concretions or gravel.

This type of soil predominates in the valley west of a distinct bluff line, running in a general north and south direction, near Midlothian and Oak.

The soil is very sticky when wet and hard when dry, and where it is not cultivated during a dry season large cracks are formed. It breaks up in clods when plowed, but it is easily put in good condition by harrowing.

The topography varies from level to gently rolling, though probably the greater proportion is almost level. The drainage is fairly good, but open ditches are an advantage on the level areas during wet seasons. Owing to the texture and topography of the Durant clay it suffers more from an excess of moisture than from drought. When crops are being drowned out on this valley land, as it is locally known, they are good on the high hills. The conditions are just the reverse in times of drought. Cotton yields about one-third to three-fourths bale per ace, corn 30 to 40 bushels, and oats 40 to 50 bushels.

It is well supplied with plant food but will probably need nitrogen first, with legume rotation.

Durant fine sandy loam—The surface to a depth of 8 to 10 inches is a brown to grayish-brown fine sandy loam, having a relatively high content of silt. Below this is a yellowish-gray sandy loam slightly heavier than the surface soil. This extends to about 15 inches, where it changes to a dingy yellow or yellowish-drab clay loam, which extends to a depth of 3 feet, the color becoming lighter as the depth increases.

The surface ranges from level to gently rolling and the level areas have a darker and deeper soil than those that are more rolling. This soil does not cover a very extensive area, but it is one of the most important types on account of its adaption to a greater variety of crops than any other soil of the county.

A narrow strip of this type varying from about one-fourth to three-fourths mile in width occurs south of Ennis on each side of Cummins creek. This same area extends north, passing through Ennis, becoming much broader and following the Texas Midland railroad to Valley Creek. Other small areas are found scattered along this creek. Another comparatively large area is found in the vicinity of Bristol.

Owing to the open structure of this soil it has good surface and underground drainage. For this same reason it is easily cultivated, and any clods that may be formed in plowing are readily broken down by light harrowing. The type is planted principally to cotton, although some corn and oats are grown. Cotton averages about one-fourth bale, although three-fourths bale per acre is sometimes secured. Corn yields 20 to 30 bushels per acre and oats about the same. Cowpeas and peanuts would do well on this soil. Much better returns could be secured from this soil by growing of truck and fruit than with the crops to which it is at present devoted. It is used very little for special crops, though some blackberries, dewberries, and melons are produced, and occasionally a few fruit trees are seen.

It needs a legume rotation, and the use of fertilizers would be advised for truck crops.

Durant loam—The soil to a depth of 10 to 12 inches, is a dark-brown to dark-gray loam, containing some fine sand and rather high percentage of silt. There is no sharp line of demarcation between the soil and subsoil, the one passing into the other gradually through a zone 4 to 6 inches thick. This soil becomes heavier in texture and lighter in color as the depth increases. The subsoil varies from a bluish or drab clay loam, to a yellowish-mottled clay, sometimes containing reddish-brown spots.

The topography of the type varies from level to slightly rolling, although by far the greater portion of it is level. This type is of such a texture that it will stand both wet and dry seasons better than any other type in the area. The largest body occurs south of Ennis, beginning about the city limits and extending south of the county line. When the soil is plowed, clods are formed, but these are readily pulverized.

The type is not a difficult one to cultivate and when in good condition forms a mellow loam.

The Durant loam is one of the most desirable soils found in the area. It is well adapted to general farming. Cotton yields about one-third to three-fourths bale per acre, corn 30 to 40 bushels, and oats 35 to 50 bushels. This type is also well adapted to fruit, peanuts, and potatoes. It is well supplied with plant food, and will need nitrogen and legume rotation first.

Durant very fine sandy loam—This varies very widely, but on an average it consists of a yellowish-brown very fine sandy loam, underlain by a pale yellowish-gray sandy loam, somewhat more tenacious than the soil. The texture varies from a heavy fine sandy loam to a light loam.

It is found in two areas on the southeast side of Grove Creek, the largest of which averages about three-fourths mile in width and 4 miles in length. It follows along the stream bordering the Trinity clay. The other area is only a half mile down the stream from the larger one, and between these two areas is the Durant loam. The type is broken and hilly and cut by numerous short and narrow V-shaped valleys. Very little of it is under cultivation, being used chiefly for grazing. It is too hilly and eroded to cultivate very easily. If the sod were broken the soil would soon be washed down into the valley. It is rich in plant food.

Ellis clay—The surface is a yellowish-brown clay. The subsoil is a heavy plastic clay to a depth of 3 feet or more. In many places scattered over the surface and throughout the soil and subsoil are fragments of hard limestone. The soil is very sticky and plastic when wet and it bakes hard on drying. It is somewhat difficult to cultivate unless handled exactly at the proper time, when it is neither too wet nor too dry.

The surface features of the type vary from rolling to hilly and broken. The broken areas have been badly eroded by the numerous small streams which traverse them.

The greater part of the Ellis clay lies in the valley in the western part of the county. The largest single area mapped is situated northwest of Midlothian. It runs north and south for about 4 miles and varies about 1 mile to 1 1-2 miles in width. A narrow strip fringes the bluff line between the valley soils and the Houston stony clay.

Because of its surface features and the difficulty in handling this soil, the greater proportion is generally used for pastures, for which purpose it is best adapted. Practically all of the type that is cultivated is devoted to cotton. Cotton does better than any other cultivated crop, although it is often difficult to secure a good stand. The stalks are never large, but they fruit well. The yield ranges from one-fourth to one-half bale per acre. It is well supplied with plant food.

Houston black clay—The soil to a depth of 10 inches is a very heavy tenacious black clay, containing a very high percentage of organic matter. The subsoil is a heavy black clay having practically the same characteristics as the soil, although it is a little lighter in color.

The type is locally known as "black land." When dry and well cultivated it is very friable and easily worked. When plowed too wet it forms clods, but after they have been exposed to the weather for some time, they break down to a certain degree and the soil can be put into a good mechanical condition by means of a light harrow. If not tilled, the soil cracks badly in dry weather; sometimes the cracks are several inches wide and several feet deep. In wet weather, and especially during the winter months, this clay sticks to the wagon wheels in large quantities.

The topography of the Houston black clay varies from level to rolling. The drainage is good during an average season, but the level areas suffer from an excess of moisture during a wet season. Open ditches are sometimes found on the level areas and more of them would prove beneficial.

The Houston black clay is the most important soil in the area, covering more than one-third of the county. It occurs in one broad and very uniform body and one of smaller size. The larger body, with a width varying 15 to 20 miles, extends diagonally across the county from the northeast corner to the southwest corner. This broad area is broken practically only along the stream courses. The other area is in the southeastern corner of the county and is about 8 miles long and 2 to 5 miles wide.

This is a very productive soil. It is well suited to cotton, corn, and small grain. The greater portion of it is planted in cotton, other crops being grown only to a small extent. Alfalfa does well on the level areas. On an average, the yield of cotton is one-fourth to one-half bale per acre, although during a favorable season one bale is not uncommon. Corn yields 30 to 40 bushels, and oats 40 to 60 bushels per acre.

The soil is well supplied with plant food. The analysis indicates that nitrogen and phosphoric acid will probably be needed first. The pot experiment in Table 13 indicates a need for nitrogen. The greatest need of this soil is a proper legume rotation.

Houston clay—The surface soil extends to a depth of 6 inches, varies from a gray to brownish-gray clay, and contains a high percentage of silt. The subsoil is a light-gray to pale yellowish-gray, and sometimes almost a white clay containing a high percentage of silt. Both the soil and the subsoil frequently contain lime concretions and fragments of limestone. This soil is not typically developed in the county, all of the area being small and lacking uniformity.

Practically all of the type is found along the slopes of the streams, although some spots are on knolls. As a general rule the underlying limestone or white rock lies 18 to 30 inches below the surface.

The topography of this type is gently rolling and hilly, although small level areas are sometimes found on the tops of hills. The Houston clay is confined principally to the central and western parts of the county, being located along the south prong of the Waxahachie and Red Oak creeks in small scattering areas. Owing to the hilly and eroded condition a large percentage of it is uncultivated. When wet it is very sticky, and on drying the surface bakes very hard, but does not crack like the Houston black clay. It is comparatively easy to cultivate, and after it is plowed and the clods are broken it becomes quite loose and acts somewhat like a silt. When the subsoil is dry it has the appearance of powder.

The type is well drained and sometimes suffers from drought. On account of the various phases of this soil, which are generally of different depths, it is hard to estimate the crop yields. Oats seem to do better than any other crop, the yield ranging from 35 to 45 bushels. Cotton will probably produce one-third to one-half bale and corn 20 to 35 bushels per acre. The Houston clay is better adapted to the growing of fruit than any of the other clay types in the county.

This soil is well supplied with plant food.

Houston stony clay—The soil varies from 4 to 8 inches in depth, and consists of a dark-brown or black clay. When cultivated, it becomes comparatively loose and friable. A large number of limestone fragments of varying size are scattered over the surface and throughout the soil. At depths ranging from 5 to 10 inches the parent limestone is encountered in place. It sometimes lies at a greater depth, but seldom deeper than 15 inches. Along the slopes and on some of the higher knolls, where erosion has been more active, the rock is exposed at the surface.

The Houston stony clay is locally known as white rock land, the name being suggested by the chalky limestone, underlying the type.

This type occurs mainly as one large and almost unbroken area, extending north and south the entire length of the county. It is about 30 miles in length and ranges from 1 to 8 miles in width. The type is very uniform and is broken only by the bottoms along the streams and by small spots of Houston clay.

The topography is for the most part rolling, though it becomes rough and hilly along some of the streams. It is easily eroded. Deep gullies extending from the hills to the streams are common. The numerous small streams with narrow V-shaped valleys traversing this soil type rapidly remove excess water in times of heavy rains and the topography is such that thorough drainage is maintained. The type is inclined to be droughty, although the moisture conditions are much better than would be thought, considering the fact that the soils rest upon rock so near the surface. This rock, however, is soft and seamed, which enables it to hold a certain amount of moisture. There are sometimes small spots in which the crops are distinctly inferior, though there is apparently no difference between the soil here and in the rest of the field. A close examination shows that a very thin crust of hard limestone overlies the chalky material under these spots and that the plants are simply suffering from lack of moisture.

The type varies somewhat in fertility with variation in depth. When the soil is only 3 or 4 inches deep the yields are much smaller than when there is a depth of 6 to 8 inches. It is comparatively easy to cultivate, considering the stony character. The stones being soft, they are easily broken and are not as severe on farm machinery as harder stone would be. The yields on this type depend more on the seasons than upon any other one factor. Drought occasionally causes almost a total failure. On the other hand during a season of floods and heavy rains it produces better yields than the Houston black clay. The yields ordinarily secured are: Cotton one-third to one-half bale; corn, 20 to 30 bushels; wheat about 12 bushels; and oats about 35 bushels per acre. The soil is especially adapted to small grains.

The soil is well supplied with plant food. Legume rotation is needed first.

Susquehanna fine sandy loam—This has the widest variation of all types encountered in the county, and it is difficult to collect a representative sample. While the soil is a fine sandy loam, the content of sand varies. There is also a wide variation in color. The greater portion of the type is a yellowish or reddish-brown fine sandy loam with a depth of 18 inches. The subsoil from 8 to 36 inches is an orange-colored or yellowish-red sticky sandy clay.

The type occurs along Chambers creek and Trinity river, the greater portion being along Chambers creek. The largest and most uniform area is found in the western part of the county, lying between the north and south prongs of Chambers creek.

The topography varies from level to gently rolling, the type being confined largely to the slopes along streams.

The crop yields vary with the different phases of the type. The soil is easily cultivated and the drainage is good. During a dry season it suffers from lack of moisture. It is especially adapted to fruit and truck, though very little of it is cultivated.

The sample examined is well supplied with phosphoric acid and potash but low in nitrogen.

Trinity clay—The soil to a depth of 10 inches varies from a brownish-black to black clay. The subsoil to a depth of 36 inches is a yellowish-brown or grayish-brown stiff tenacious clay. Sometimes the soil has a slightly yellowish tinge.

This alluvial soil occurs principally along the Trinity river and Waxahachie and Chambers creeks. The largest area along Chambers creek is found on the east side after it crosses the Missouri Kansas & Texas railway, and is about one-half to three-fourths of a mile wide.

The topography of this type is level, with slight depressions scattered through it in the form of lakes and sloughs. When wet this type is very waxy and gummy, but when dry and cultivated it is friable and comparatively easy to till. All this type is subject to overflow. The areas under cultivation are in the most elevated portions, generally near the streams or along the outer edge of the bottoms.

That portion of the type which is cultivated produces excellent yields of cotton and corn. Most of it is planted to corn, which yields 40 to 60 bushels per acre. It is especially adapted to alfalfa, which yields ordinarily 4 to 5 tons per acre. It is well supplied with plant food.

Wilson clay loam—The soil consists of 10 inches of a dark-brown to almost black clay loam. The subsoil, to a depth of 3 feet, is a grayish, black, or brown clay. The color becomes lighter as the depth increases and is frequently yellowish below 30 inches. Lime nodules are sometimes scattered through both the soil and the subsoil, and white spots, due to their partial decomposition, are occasionally seen in the subsoil.

This type occurs in the eastern part of the county, being restricted entirely to the region east of a line running north and south through Bardwell. The largest and most uniform area is found south of this town. Other important areas are developed along the eastern side of Mustang and

Chambers creeks and on the north side of Walker creek. In the vicinity of Crips is a comparatively large area, and another one is found about 2 miles east of Ferris.

The Wilson clay loam has good drainage during an average season, with the exception of an occasional small depression. Along the slopes small eroded areas are sometimes found. The topography varies from rolling to level. The level areas sometimes suffer from an excess of moisture during a wet season.

The type is comparatively easy to cultivate. It sometimes breaks up in clods, but when these are crushed and the soil put in a good state of cultivation, it forms a mellow loam. It is especially adapted to corn, cotton, and oats. Corn yields 30 to 45 bushels, cotton one-third to three-fourths bale, and oats 40 to 50 bushels per acre. It is well supplied with plant food.

SOILS OF WASHINGTON COUNTY

Washington County is in the southeastern part of Texas, about 120 miles from the Gulf of Mexico. The elevation is about 200 to 350 feet above sea level. Most of the land is upland, although some bottom land is also found in the county. The principal crops are corn, cotton, hay, Irish potatoes, vegetables, sugar cane, and sweet potatoes, oats, cowpeas.

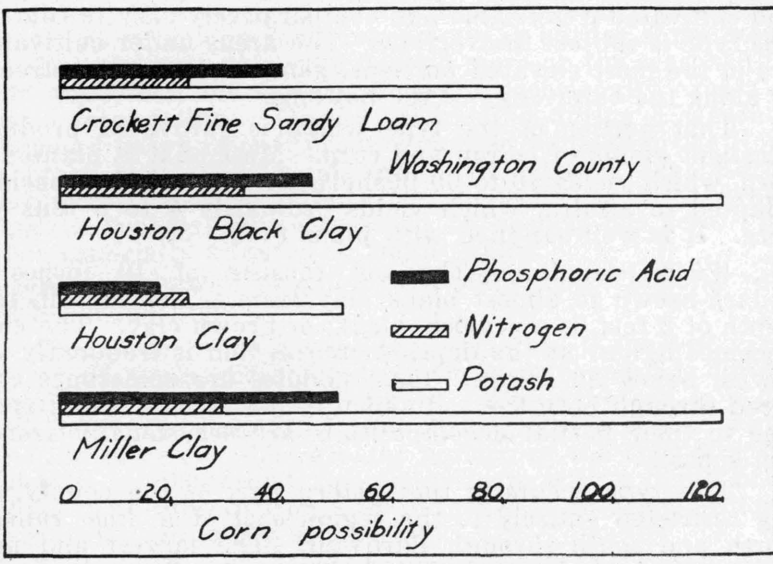

Figure 6—Corn possibility in bushels per acre of the active phosphoric acid, total nitrogen, and active potash of some soil types of Washington County.

Eleven types of soils have been mapped, belonging to five series. Houston black clay occupies 32.6 per cent. of the area, Crockett fine sandy loam occupies 26.3, Houston loam occupies 15.7, and Trinity clay, which is a bottom-land soil, 9.9 per cent.

The Houston black clay, which occupies a large percentage of the area, is a heavy, durable, calcareous soil, widely distributed through central Texas. In some places it has been in cultivation for a long time, and has begun to fall off considerably in fertility.

The average chemical composition of the soils of this area is given in Table 2. The interpretation of analyses is given in Table 14. The analyses of the individual samples are given in Table 15. Pot experiments are given in Table 16. A marked difference is seen between the fertility of the upland soils and the bottom land soils, and the Houston black clay seems to be better supplied with plant food than the other upland soils.

TABLE 14—INTERPRETATION OF ANALYSES—WASHINGTON COUNTY.

Laboratory Number		Phosphoric Acid	Potash	Lime	Acidity	CORN POSSIBILITY TWO MILLION POUNDS			Area	Per cent of area
						Active phosphoric acid	Total Nitrogen	Active Potash		
12512-12518-12984	Crockett fine sandy loam—surface..	good	fair	good	0	40	23	80	103,232	26.3
12513-12519-12985	Crockett fine sandy loam—subsoil..	low	good	high	0	12	28	37		
12502	Houston black clay—surface.......	good	fair	high	0	45	33	120	128,000	32.6
12503	Houston black clay—subsoil.......	good	good	high	0	45	33	80		
12490	Houston clay loam—surface.......	low	low	high	0	12	23	37	2,176	0.6
12499	Houston clay loam -subsoil........	low	low	high	700	6	23	37		
4303-12500-7339	Houston loam - surface...........	low	low	good	0	18	23	51	61,568	15.7
4304-12501-7340	Houston loam—subsoil............	low	good	high	300	12	18	37		
12520	Lufkin fine sandy loam—surface....	low	fair	good	0	24	28	51	26,368	6.7
12521	Lufkin fine sandy loam—subsoil....	low	good	high	0	18	23	29		
12516	Miller clay—surface..............	good	good	high	0	50	28	120	18,880	4.8
12517	Miller clay—subsoil...............	good	good	high	0	50	28	80		
12514	Miller very fine sandy loam—surface	good	good	high	0	50	28	51	5,760	1.5
12515	Miller very fine sandy loam—subsoil	good	good	high	0	50	33	157		
12504	Trinity clay—surface............	good		high	0	50	33	80	38,848	9.9
12505	Trinity clay—subsoil.............	good	good	high	0	30	28	37		

The greatest need of the soils of this area is a systematic rotation of crops in which a legume is grown to be turned under or grazed off. Such a rotation would supply nitrogen and vegetable matter to the soil, and enable it to resist dry weather better, aid in destroying plant diseases and insect pests, and in other respects increase the size of the crops, as well as place the farming of the county on a stable foundation. Until suitable rotations are generally adopted, the soils of this and other counties will continue to decrease in fertility.

The Houston black clay and the Houston loam do not usually respond well to fertilizers, although it is possible that after a proper rotation has been established and the land brought up into good physical condition, the application of fertilizers will be of benefit to some of the land. The other upland soils are likely to need some fertilizers, especially phosphoric acid, but the rotation is needed most of all. The various deficiencies of the various soil types are shown in the discussion of the types and in the table of analyses.

TABLE 15.—WASHINGTON COUNTY—COMPOSITION OF SOIL

Laboratory Number		Phosphoric Acid Total Percent	Phosphoric Acid Active Per Million	Nitrogen Percent	Potash Total Percent	Potash Acid Soluble Percent	Potash Active Per Million	Lime Acid Soluble Percent	Magnesia Acid Soluble Percent	Basicity Percent	Acidity per Million
12512	Crockett fine sandy loam—surface	.022	20.0	.105	.69	.15	141.2	.34	.25	.75	0
12518	Crockett fine sandy loam—surface	.029	31.2	.073	.73	—	166.2	.43	.27	.94	0
12984	Crockett fine sandy loam—surface	.086	238.1	.043	.72	.07	202.4	.72	.25	1.34	0
	Average	.046	93.1	.074	.71	.11	169.9	.50	.26	1.01	0
12513	Crockett fine sandy loam—subsoil	.028	7.5	.114	.66	.21	90.0	.58	.37	1.15	0
12519	Crockett fine sandy loam—subsoil	.021	25.0	.078	.57	.13	100.0	.47	.14	.99	0
12985	Crockett fine sandy loam—subsoil	.033	17.5	.058	.99	.32	—	.62	.62	1.04	0
	Average	.027	16.7	.083	.74	.22	95.0	.56	.38	1.06	0
12502	Houston black clay—surface	.061	168.1	.119	.66	.25	265.6	4.41	.52	7.43	0
12503	Houston black clay—subsoil	.051	128.1	.117	.48	.27	160.0	4.89	.54	8.24	0
12498	Houston clay loam—surface	.021	18.7	.070	.22	.08	81.2	.60	.30	1.35	0
12499	Houston clay loam—subsoil	.014	10.0	.070	.36	.08	63.7	.59	.27	1.35	700
4303	Houston loam—surface	.023	33.8	.058	.86	.13	180.0	.65	.13	.70	0
12500	Houston loam—surface	.014	17.5	.060	.26	.03	60.0	.19	.23	.55	0
7339	Houston loam—surface	.031	18.2	.090	.72	.11	113.7	.60	.18	1.26	0
	Average	.023	23.2	.069	.61	.09	117.9	.48	.18	.84	0
4304	Houston loam—subsoil	.028	18.8	.039	.82	.25	115.0	.70	.22	1.35	0
12501	Houston loam—subsoil	.015	9.4	.071	.29	.07	51.2	.36	.26	.65	0
7340	Houston loam—subsoil	.029	11.2	.066	.56	.16	81.2	.69	.26	1.06	900
	Average	.024	13.1	.059	.56	.16	82.5	.58	.25	1.02	—
12520	Lufkin fine sandy loam—surface	.019	33.1	.086	.99	.13	136.2	.44	.18	.94	0
12521	Lufkin fine sandy loam—subsoil	.021	24.4	.080	.93	.21	13.0	.77	.38	1.30	0
12516	Miller clay—surface	.121	235.0	.094	2.29	1.34	295.0	6.08	1.82	9.10	0
12517	Miller clay—subsoil	.110	206.2	.082	2.28	.72	196.2	6.43	.84	9.40	0
12514	Miller very fine sandy loam—surface	.062	247.5	.082	1.46	.22	105.0	3.54	.24	6.78	0
12515	Miller very fine sandy loam—subsoil	.122	335.6	.101	1.84	1.18	335.6	4.65	.53	8.55	0
12504	Trinity clay—surface	.075	235.6	.112	1.10	—	170.0	1.63	.46	2.76	0
12505	Trinity clay—subsoil	.051	50.0	.087	.96	.30	97.5	.85	.42	1.55	0

DESCRIPTION OF SOILS OF WASHINGTON COUNTY

Crockett fine sandy loam—This consists of a grayish-brown, brown or dark-brown loamy fine sand, underlain at 12 to 20 inches by a plastic, stiff clay or fine sandy clay of a reddish-brown, yellowish-brown, or mottled dull-red and reddish-yellow color. As a rule the subsoil grades into a dull-red to yellowish-red, lighter textured clay at about 30 inches.

The type is easy to handle and can be cultivated soon after rains. Crops suffer more or less from lack of moisture during dry periods, although the clay subsoil is retentive of moisture and with care would be able to hold a sufficient store to supply the growing crops. It occurs as a broad irregular belt, extending from Wesley in a northeasterly direction through Brenham and Earlywine to the Brazos River Bottoms. There are a number of large areas in the northern part of the county and numerous small scattered areas in other sections.

It is the second most extensive type in the county. Where the color of the soil is dark-brown, it is known as "black sand" and where lighter as "yaupon land." It is not as good soil for growing cotton and corn as the Houston soils, but is a better type for use for producing sweet and Irish potatoes, cowpeas, peanuts, bur clover, and garden vegetables. Corn yields 25 bushels and cotton one-fourth to one-third bale per acre. It will need legume rotation and nitrogen first.

TABLE 16—POT EXPERIMENTS, SOILS OF WASHINGTON COUNTY.

		Weight Crops in Grams				Corn Possibility of Plant Food Withdrawn		
		Complete Fertilizer	No Phosphoric Acid	No Nitrogen	No Potash	Phosphoric Acid	Nitrogen	Potash
12512	Crockett fine sandy loam—surface—corn —1918	52.8	33.6	17.4	47.4	38	23	209
12512	Crockett fine sandy loam—surface—sorghum —1918	39.9	25.3	8.4	26.2	23	9	74
12512	Crockett fine sandy loam—surface—corn —1919	16.8	34.4	6.2	19.1	12	10	29
12512	Crockett fine sandy loam—surface—sorghum —1919	26.9	7.8	14.9	8.4	9	25	10
	Average	34.1	25.4	11.7	25.4	20	17	81
12513	Crockett fine sandy loam—subsoil—corn —1918	54.8	17.3	32.4	54.7	19	36	210
12513	Crockett fine sandy loam—subsoil—sorghum —1918	44.0	14.5	4.3	34.2	17	6	53
12513	Crockett fine sandy loam—subsoil—corn —1919	30.8	7.5	4.4	22.4	10	8	38
12513	Crockett fine sandy loam—subsoil—sorghum —1919	29.6	6.5	2.1	3.8	6	4	4
	Average	37.3	11.5	10.8	28.8	13	13	76
12518	Crockett fine sandy loam—surface—corn —1918	54.4	38.2	11.9	42.9	43	22	281
12518	Crockett fine sandy loam—surface—sorghum —1918	31.2	21.9	12.2	26.3	20	14	62
12518	Crockett fine sandy loam—surface—corn —1919	36.8	12.2	6.0	23.2	15	10	53
12518	Crockett fine sandy loam—surface—sorghum —1919	52.4	24.9	7.1	35.0	32	12	61
	Average	43.7	24.3	9.3	31.9	27	15	114
12519	Crockett fine sandy loam—subsoil—corn —1918	50.7	14.4	17.2	42.8	19	19	190
12519	Crockett fine sandy loam—subsoil—sorghum —1918	45.0	19.8	7.4	33.2	17	9	48
12519	Crockett fine sandy loam—subsoil—corn —1919	34.2	7.5	3.1	17.1	9	6	37
12519	Crockett fine sandy loam—subsoil—sorghum —1919	45.9	16.7	5.8	24.7	17	7	31
	Average	43.7	14.6	8.4	29.5	15	10	77
12502	Houston black clay—surface—corn —1917	28.7	20.9	14.3	39.3	49	27	734
12502	Houston black clay—surface—sorghum—1917	13.7	10.1	14.4	9.3	20	40	116
12502	Houston black clay—surface—corn —1918	41.0	37.5	8.2	38.2	38	13	295
12502	Houston black clay—surface—sorghum—1918	21.9	16.1	17.3	22.6	15	24	137
	Average	26.3	21.2	13.6	27.4	30	26	321
12503	Houston black clay—subsoil—corn —1917	24.8	17.7	7.5	22.8	70	11	139
12503	Houston black clay—subsoil—sorghum—1917	13.9	14.9	12.4	9.5	23	24	111

TABLE 16—POT EXPERIMENTS, SOILS OF WASHINGTON COUNTY,—Continued.

Laboratory Number		Weight Crops in Grams				Corn Possibility of Plant Food Withdrawn		
		Complete Fertilizer	No Phosphoric Acid	No Nitrogen	No Potash	Phosphoric Acid	Nitrogen	Potash
12503	Houston black clay—subsoil—corn —1918	50.5	38.0	8.1	46.8	11	11	230
12503	Houston black clay—subsoil—sorghum—1918	28.5	13.0	19.1	26.1	14	23	125
	AVERAGE	29.4	20.9	11.8	26.3	30	18	151
12498	Houston clay loam—surface—corn —1917	38.7	18.0	5.0	31.8	28	8	118
12498	Houston clay loam—surface—sorghum—1917	16.4	8.9	7.7	14.9	11	16	58
12498	Houston clay loam—surface—corn —1918	29.8	15.6	6.1	33.3	18	9	52
12498	Houston clay loam—surface—sorghum—1918	20.0	8.6	8.3	16.3	7	12	35
	AVERAGE	26.3	12.8	6.8	24.1	16	11	57
12499	Houston clay loam—subsoil—corn —1917	36.3	7.4	8.1	26.8	10	12	79
12499	Houston clay loam—subsoil—sorghum—1917	15.9	5.1	4.9	10.1	6	9	48
12499	Houston clay loam—subsoil—corn —1918	38.3	10.1	4.7	31.8	15	12	79
12499	Houston clay loam—subsoil—sorghum—1918	17.8	7.5	4.4	16.2	7	....	10
	AVERAGE	27.1	7.5	5.5	21.2	9	11	54
12500	Houston loam—surface—corn —1917	38.4	12.7	7.3	32.7	20	10	102
12500	Houston loam—surface—sorghum—1917	16.3	9.6	6.4	11.3	32	11	47
12500	Houston loam—surface—corn —1918	37.3	15.1	3.8	23.7	15	5	23
12500	Houston loam—surface—sorghum—1918	14.1	8.2	5.1	10.1	7	8	16
	AVERAGE	26.5	11.4	5.7	19.5	18	9	47
12501	Houston loam—subsoil—corn —1917	40.8	8.0	10.2	34.5	13	20	67
12501	Houston loam—subsoil—sorghum—1917	17.6	7.4	5.7	11.2	5	8	41
12501	Houston loam—subsoil—corn —1918	38.6	11.8	4.6	26.1	12	6	31
12501	Houston loam—subsoil—sorghum—1918	18.1	8.9	4.7	9.4	9	8	22
	AVERAGE	28.8	9.0	6.3	20.3	10	10	40
7339	Houston loam—surface—corn —1915	38.2	—	13.0	—	19	....	....
7339	Houston loam—surface—sorghum—1915	32.0	—	8.4	—	15	....	....
7339	Houston loam—surface—corn —1916	34.2	—	4.2	—	....	....	....
7339	Houston loam—surface—sorghum—1916	37.2	—	7.6	—	....	....	....
	AVERAGE	35.4	—	8.3	—	17	—	—

TABLE 16.—POT EXPERIMENTS, SOILS OF WASHINGTON COUNTY.—Continued.

		Weight Crops in Grams				Corn Possibility of Plant Food Withdrawn		
		Complete Fertilizer	No Phosphoric Acid	No Nitrogen	No Potash	Phosphoric Acid	Nitrogen	Potash
7340	Houston loam—subsoil—corn —1915	39.9	—	15.5	—	21	....	....
7340	Houston loam—subsoil—sorghum—1915	24.7	—	2.8	—	6	....	....
7340	Houston loam—subsoil—corn —1916	24.7	—	31.4	—	....	....	....
7340	Houston loam—subsoil—sorghum—1916	23.8	—	2.2	—	....	....	....
	AVERAGE	28.3	—	12.1	—	14	....	....
12520	Lufkin fine sandy loam—surface—corn —1918	63.0	34.4	33.2	56.9	36	40	340
12520	Lufkin fine sandy loam—surface—sorghum—1918	47.3	30.5	8.5	37.0	24	10	72
12520	Lufkin fine sandy loam—surface—corn —1919	31.9	10.4	4.3	24.0	10	7	44
12520	Lufkin fine sandy loam—surface—sorghum—1919	46.8	15.5	6.0	23.1	13	8	42
	AVERAGE	47.3	22.7	13.1	35.3	21	16	124
12521	Lufkin fine sandy loam—subsoil—corn —1918	63.6	11.4	34.0	60.8	11	39	353
12521	Lufkin fine sandy loam—subsoil—sorghum—1918	43.2	20.4	4.2	35.1	17	6	61
12521	Lufkin fine sandy loam—subsoil—corn —1919	32.3	4.7	4.4	24.2	6	8	67
12521	Lufkin fine sandy loam—subsoil—sorghum—1919	44.9	11.2	4.7	19.6	9	6	37
	AVERAGE	46.0	11.9	11.8	34.9	11	15	130
12516	Miller clay—surface—corn —1918	50.5	37.6	21.1	42.5	39	28	554
12516	Miller clay—surface—sorghum—1918	49.6	39.5	10.8	39.9	37	13	331
12516	Miller clay—surface—corn —1919	24.5	11.6	4.3	20.4	14	8	221
12516	Miller clay—surface—sorghum—1919	48.9	20.7	4.7	45.5	15	165	248
	AVERAGE	43.4	27.4	10.2	37.1	26	53	364
12517	Miller clay—subsoil—corn —1918	45.2	24.5	21.9	47.2	30	27	649
12517	Miller clay—subsoil—sorghum—1918	42.4	36.9	6.9	39.4	31	21	269
12517	Miller clay—subsoil—corn —1919	26.4	7.7	3.9	23.8	10	7	190
12517	Miller clay—subsoil—sorghum—1919	37.9	11.9	3.9	32.4	12	5	167
	AVERAGE	38.0	20.3	9.2	35.7	21	15	319
12514	Miller very fine sandy loam—surface—corn 1918	22.3	22.4	4.6	26.6	28	7	197
12514	Miller very fine sandy loam—surface—sorghum—1918	42.0	40.9	2.6	37.3	38	4	114

TABLE 16.—POT EXPERIMENTS, SOILS OF WASHINGTON COUNTY.—Concluded.

		Weight Crops in Grams				Corn Possibility of Plant Food Withdrawn		
		Complete Fertilizer	No. Phosphoric Acid	No. Nitrogen	No. Potash	Phosphoric Acid	Nitrogen	Potash
12514	Miller very fine sandy loam—surface—corn —1919	23.5	10.8	5.0	21.7	17	9	68
12514	Miller very fine sandy loam—surface—sorghum—1919	32.8	23.6	5.2	20.8	21	6	71
	AVERAGE	30.2	24.4	4.4	26.6	26	7	112
12515	Miller very fine sandy loam—subsoil—corn —1918	41.2	27.8	12.7	31.3	28	16	383
12515	Miller very fine sandy loam—subsoil—sorghum—1918	41.4	39.3	7.5	36.5	30	13	232
12515	Miller very fine sandy loam—subsoil—corn —1919	21.8	15.1	6.7	25.3	19	11	133
12515	Miller very fine sandy loam—subsoil—sorghum—1919	41.5	27.9	5.6	39.9	30	9	167
	AVERAGE	36.5	27.5	8.1	33.3	27	12	229
12504	Trinity clay—surface—corn —1917	36.4	29.4	11.1	25.4	50	18	27
12504	Trinity clay—surface—sorghum—1917	14.7	14.6	12.4	11.8	29	24	90
12504	Trinity clay—surface—corn —1918	33.4	31.9	7.3	32.4	47	13	30
12504	Trinity clay—surface—sorghum—1918	6.6	4.5	14.0	4.7	10	19	31
	AVERAGE	22.8	20.1	11.2	19.8	34	19	44
12505	Trinity clay—subsoil—corn —1917	25.4	14.8	17.8	26.5	19	15	71
12505	Trinity clay—subsoil—sorghum—1917	8.0	6.2	6.8	11.6	8	13	71
12505	Trinity clay—subsoil—corn —1918	45.4	17.1	6.9	28.5	21	9	106
12505	Trinity clay—subsoil—sorghum—1918	15.9	3.4	6.6	7.3	3	10	44
	AVERAGE	23.7	10.4	9.5	18.5	13	12	73

Houston black clay—The typical soil consists of a black or nearly black clay which grades downward through a dark-gray, stiff, heavy clay, into a drab, dark-drab, or gray, plastic, waxy clay, mottled with yellow. The latter usually begins at about 16 to 24 inches and frequently contains a whitish, calcareous material in spots or small pockets and concretions of black oxide of iron. When dry the soil is loose and granular, but when wet it is very waxy and sticky. The substratum usually consists of a light gray, calcareous clay, slightly mottled by the admixture of yellowish clay.

The Houston black clay, commonly known as "black land," is the most difficult soil in the county to cultivate. It cannot be worked satisfactorily when very wet because of its extremely adhesive nature. If worked when the moisture conditions are most favorable, that is, just after the soil has dried sufficiently not to be sticky, it breaks up into granules; but if cultivated when too wet the granules coalesce, and form lumps or clods. These, however, owing to the high lime content, disintegrate or pulverize rapidly on drying out. It is much easier to secure a good condition of tilth on this type than on a soil of equally heavy texture but having a lower lime content.

This type comprises the greater part of the uplands of Washington county. The largest area occurs in the vicinity of Burton. It extends south from there to the county line, north to the Yegua creek bottoms and northeast until it crosses the Gulf, Colorado and Santa Fe railroad. The second largest area is in the southwestern part of the county, between Stone and the bottom lands of the Brazos river.

The characteristic topography is gently rolling to rolling, with gentle, regular slopes and broad divides of almost flat or slightly arched surface. The surface drainage is mainly good.

Cotton and corn are the principal crops grown on this type. Corn averages 35 to 40 bushels, and cotton one-third to one-half bale to the acre, though by careful cultivation higher yields of both crops can be obtained. Sorghum does well. The type is well adapted to alfalfa, yielding 3 to 5 tons per acre.

The Houston black clay is the most productive upland soil in the county. Though it is still a strong soil, it is slowly depreciating under the one-crop system generally practiced. It needs a legume rotation first. It is well supplied with phosphoric acid and potash.

Houston clay loam—The soil consists of grayish-brown to nearly black silty clay loam or clay loam, 8 to 15 inches or 20 inches deep. It is underlain by a yellowish calcareous clay passing quickly into a mixture of yellow clay and white chalky material, apparently rotten limestone.

At just the right moisture content, this type is very easy to handle; but when it is fairly dry, plowing is difficult. The type retains moisture well.

The Houston clay loam type occurs in spots, mainly in the vicinity of Valley Ford school, Zionsville, and Longpoint. The type occupies knolls, the crest of ridges, and steep slopes along stream channels throughout the black prairie land. The drainage is good.

Corn and grasses do well on this soil, and most of the type is devoted to their production. Corn yields 40 to 50 bushels per acre. The grasses are largely used for pasturage, as the fields are green throughout the growing seasons. Irish potatoes are grown occasionally, with good results. Practically all of this type is under cultivation.

The sample examined is low in total and active phosphoric acid and not well supplied with nitrogen. It is not as good as the above description would require.

Houston loam—The average soil is a grayish-black to dark-brown loam, which becomes heavier with depth, the lower part of the surface soil being in many places an almost black, heavy fine sandy loam clay. The subsoil beginning at about 10 to 20 inches consists of a dark-gray sandy clay or sandy clay loam mottled with yellow to yellowish-brown. The subsoil is rather stiff and plastic and becomes lighter in color and depth. The soil varies from a dark-brown to black sandy loam or heavy sandy loam, through a loam, to a heavy fine sandy clay. The type is easier to handle than the Houston black clay, and can be cultivated under a comparatively wide range of moisture conditions. If plowed when too wet it cracks and checks to some extent, but not enough to cause excessive loss of moisture. It is fairly resistant to drought, crops suffering from lack of moisture only during exceptionally long periods of dry weather.

The largest areas of the Houston loam are in the northern half of the county. The surface is gently rolling to rolling with occasional steep slopes. Drainage is good and erosion not excessive.

It is well adapted to the production of cotton, corn, Johnson grass, alfalfa, and a number of forage crops such as cowpeas, sorghum, vetch, and bur clover. Cotton yields one-third to one-half bale to the acre, but with proper cultivation and fertilization as much as one bale has been obtained. The type is well suited to alfalfa, which yields 3 to 5 tons of hay, with three cuttings per season. Irish potatoes and sweet potatoes are grown successfully. Oats are grown on a small acreage only.

It is somewhat low in nitrogen and phosphoric acid. The pot experiment in Table 16 also shows a response to nitrogen and phosphoric acid. It needs a legume rotation and possibly the use of acid phosphate.

Lufkin fine sandy loam—This is a brownish-gray loamy fine sand to light fine sandy loam, underlain at about 8 to 10 inches by a brownish-gray to dark-drab fine sandy loam, which grades at 12 to 16 inches into a dark-drab to nearly black or mottled gray and yellow, waxy, plastic clay, carrying appreciable quantities of fine sand. This clay in places continues to 36 inches or more with little change, but it usually becomes lighter in color as the depth increases.

Owing to its sandy nature, this type can be cultivated under a wide range of moisture conditions, though there are water-logged areas in which the soil dries out slowly. It is easily handled and does not require very heavy teams or farm implements.

It occurs only in the extreme western part of the county, beginning 2 or 3 miles west and northwest of Burton. This type has a level to undulating topography and lies considerably lower than the surrounding Houston and Crockett soils. Except on the slopes and higher elevations, it has poor drainage, owing both to its impervious subsoil and its flat topography.

On the cleared areas corn and cotton are the chief crops. The yields are low, owing to the rapid drying out of the soil during droughts. Cotton produces about one-fourth bale and corn 15 to 20 bushels per acre. Where the soil is properly drained, it is suited for growing peanuts, cowpeas, beans, Irish potatoes, and a number of vegetables. Artificial drainage is necessary to put this soil in the best possible condition for cultivation.

It needs legume rotation and possibly acid phosphate for best results.

Miller clay—This consists of a light chocolate-red to dark chocolate-red heavy clay, which changes but little within the 3-foot section, though the material is heavier and more compact and somewhat lighter in color between 12 and 24 inches.

It is confined to the eastern and northeastern part of the county, occurring in the first bottoms of the Brazos river to some extent along Yegua creek. It varies in width from narrow strips, to areas having a width of 4 miles.

A number of farmers have constructed dikes to protect the soil from overflow. The type is fairly well drained, though it may be improved by ditches.

Approximately 75 per cent. of the type is under cultivation. It is a very durable and productive soil. The crops consist chiefly of cotton and corn, with some alfalfa and Johnson grass. Cotton produces one-half to three-fourths bale and corn 45 bushels per acre. Alfalfa produces an average of 3 tons of hay, with three cuttings and Johnson grass 4 tons of hay per acre.

Like nearly all bottom soils, this soil is well supplied with plant food. Nitrogen and legume rotation will probably be needed first.

Miller very fine sandy loam—The surface consists of a reddish-yellow or light reddish-brown very fine sandy loam, in many places approaching a silt loam. It extends to a depth of 20 to 24 inches, and is underlain by a chocolate-red, stiff, tenacious clay. Both soil and subsoil are highly calcareous. This type is easy to handle and can be cultivated under a wide range of moisture conditions. Owing to its clay subsoil, it conserves moisture well.

It occurs in the first bottom of the Brazos river, mainly as a narrow, irregular strip along the stream bank. The type has good drainage, though occasionally flooded by the Brazos river.

Cotton does not do as well on this type as on the Miller clay, but corn, sweet potatoes, and Irish potatoes do better. Cotton yields an average of one-half bale, corn 40 to 50 bushels, and sweet potatoes 150 to 200 bushels per acre. In some cases a yield of 300 bushels of sweet potatoes is obtained. Alfalfa does well on the very fine sandy loam areas. The soil is suited to the growing of peanuts. It is well suited to the growing of tomatoes, melons, and other vegetables.

It is well supplied with plant food, being lowest in nitrogen, but fertilizers would probably benefit truck crops.

Trinity clay—The surface consists of a black clay, which becomes stiffer and more compact with depth. At about 24 to 30 inches a somewhat lighter colored, stiff, waxy clay, usually drab or dark drab in color, is encountered, and this continues to a depth of 3 feet or more. When wet the surface soil is plastic and sticky, but it cracks and granulates on drying, assuming a favorble structure.

The largest area of this type occurs along Cedar, Yegua, New Year, East Mill, Jackson, Kuykendall, and Caney creeks. It comprises narrow strips of bottom land along most of the streams of the county.

The Trinity clay occupies the overflowed first bottom of streams which rise either within local or adjoining areas of the Houston soils. Its surface is flat. During high spring freshets the type is nearly everywhere inundated.

Most of the type is forested with overcup oak, white ash, red elm, white elm, black walnut, and a little pecan and poplar. About 20 per cent. is in tilled crops. Corn yields 30 to 50 bushels and cotton one-fourth to one-half bale per acre. Johnson grass does well and yields 3 to 5 tons per acre. When properly reclaimed this soil makes excellent land for the production of cotton, corn, alfalfa, and Johnson grass. The soil also gives satisfactory yields of Japan clover, sweet clover, and cowpeas.

It is well supplied with plant food, being lowest in nitrogen.

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SUMMARY AND CONCLUSIONS

This Bulletin deals with the chemical composition, fertility, and means of increasing and maintaining soil fertility of the various types of soils found in Brazos, Camp, Ellis, and Washington Counties.